BREAK IN

Setepmber/October 2011

The Official Journal of the
New Zealand Association of Radio Transmitters (Inc.)

Dedicated to

Amateur Radio and Electronics

in New Zealand since 1928

In this issue:

- Radio frequency direction finding; Pt 1
- Professional amateurs
- Use of ferrites and filters to solve EMI problems; Pt 1
- ARISsat-1; The latest amateur radio satellite
- Telecommunications in the electricity industry
- WW2 RADAR set; cabin and equipment
- NZART RadioScience Education Trust; KiwiSat research grant

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BREAK-IN

Volume **84**
Number **5**
September/October 2011

*The term **break-in** refers to a system in CW whereby the transmitting station can hear the other station's signal during "key up" periods.*

ISSN 0006–9523

OFFICIAL JOURNAL OF THE NEW ZEALAND ASSOCIATION OF RADIO TRANSMITTERS INC.

EDITOR
John Walker ZL3IB
Phone: (03) 348-9084
Email: <editor@nzart.org.nz>

ASSISTANT EDITORS
Grahame Fraser ZL3SJ
Kelvin Barnsdale ZL3KB
(Technical and Illustrations)

ADVERTISING MANAGER
Lorne Douglas ZL2AHB
Phone: (03) 358-9100
E-mail: <advertmanager@nzart.org.nz>
for — Advertising
— Hamads

EDITORIAL ADDRESS:
EDITOR
BREAK-IN
PO BOX 1733
CHRISTCHURCH 8140
for — Articles for publication
for — Letters to Editor

CALL-BOOK EDITOR
Lorne Douglas ZL2AHB
Phone: (03) 358-9100
E-mail: <callbook@nzart.org.nz>

Preferred electronic format is as Word.doc, *.rtf or *.txt files. Graphics and pictures should NOT be embedded in the text but supplied as separate *.jpg or *.tif files with a list of captions. Hard copy should be typed double-spaced.

CLOSING DATE FOR COPY
10th of preceding month

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Typesetting and printing by ***Wyatt & Wilson Print Ltd,*** Christchurch, New Zealand.

Faulty or missing copy of Break-In
Please return faulty copy to, or contact, the Business Manager, NZART HQ, Upper Hutt who will supply a replacement. The Editor cannot supply replacement copies.

NZART SUBSCRIPTION 2010/2011

Annual Subscription:	$95.00
Student Subscription:	$40.00
Family Additional:	$30.00
Maximum Family:	$125.00
Overseas surface mail (No GST):	$95.00
Overseas airmail (No GST):	$110.00

Concessionary and spread payment applications will be considered confidentially upon application to the Business Manager.

Break-In Single Copy	(member) $5.00
	(non-member) $7.50
Call Book	(member) $17.00
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All subscription and publication prices are GST inclusive.

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Cover Photograph; Some of Kordia's state of the art satellite reception equipment. (Photo; ©Kordia)

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PAST ISSUES OF *BREAK-IN*
Indexes for past volumes of *Break-In* from 1949 to the present are available on the NZART website: <http://www.nzart.org.nz/breakin/index/index.html>

NZART HEADQUARTERS
Business Manager: Debby Morgan ZL2DL
Suite 9, 19–21 Main Street, Upper Hutt
Office hours: Tuesday – Friday 9am – 4.30pm
Postal Address: PO Box 40-525 Upper Hutt 5140

Telephone: (04) 939-2189
Fax: (04) 939-2190
Email: <nzart.hq@clear.net.nz>
Web: <http://www.nzart.org.nz/nzart> or http://www.nzart.org.nz

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From The Editor

John Walker ZL3IB
<editor@nzart.org.nz>

Looking at the contents of this issue it might almost be sub-titled *"An Antenna Issue"* since many of the articles seem to relate directly or indirectly to antenna-related topics. It could be that this reflects the fact that in today's world hams with almost universally operating with commercial equipment but antennas still remain an area for active experimentation and debate. Furthermore the keen antenna experimenter often has easy access to some excellent antenna test gear, often home-brewed, and there also many useful computer programs for the design and analysis of antennas, etc.

From the editorial point view this apparent over representation of antenna related material is simply the result of what is coming across the editorial desk. I always try to offer a reasonable balance and range of technical and general articles but in the end my final choices are dictated by the supply of copy received. So, it's over to you the readers to provide the raw material to create the contents of your magazine.

73, *John Walker ZL3IB, Editor*

Next deadline for copy is

10 November 2011

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John Walker ZL3IB, Editor.

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From The President

Roy Symon ZL2KH
<zl2kh@xtra.co.nz>

The recent casual vacancy for a Midlands District councillor has been filled. Two members made themselves available for the position and I thank them both for doing this. Council held a secret ballot by email and the successful candidate was Stuart Watchman ZL2TW. Welcome back to council Stuart.

Subscription renewal notices were distributed with the last issue of *Break-In*. Predictably these notices sparked the usual comments on reflectors that the subscription was too high. It costs a certain sum for NZART to undertake the work it does for the good of the hobby. One way to keep the subscription at the present rate or even to lower it is to increase the number of members. Under $2 a week is not expensive when it comes to protecting the spectrum we enjoy, receiving six copies per year of *Break-In,* and receiving a copy of the *Call Book.* It costs $165 a year to subscribe to the *New Zealand Listener* or the *New Zealand Woman's Weekly.* This should help to put our subscription of $95 into perspective.

Roy Symon, ZL2KH
President, NZART (Inc)

Break-In 50 Years Ago

Craig Crawford ZL3TLB

October 1961
To the Chatham Islands with the "Tucker Tin" SSB Rig
By Joe Johnson ZL2GA

Some 500 miles due east of Christchurch lie a group of islands known as the Chathams. The group consists of one large island, three smaller islands and numerous rocky islets and reefs within a radius of thirty miles. Contact with the mainland is not the best. A ship calls intermittently when there is enough cargo to warrant a trip but the main passenger service is maintained by the RNZAF who fly a Sunderland flying boat to the islands at monthly or two-monthly intervals throughout the year.

It was quite cold in the Sunderland as we flew towards the Chathams on 14 June 1961. At Evans Bay, takeoff had been delayed for half an hour because of early morning fog on the harbour, but it brightened as we flew eastwards. This was my third trip to the islands in the space of two years but it was to be a different visit this time for in my suitcases were all the necessary parts of a complete amateur 80 metre single sideband station.

On previous trips it was necessary to jettison the radio gear to meet the 44 pound free weight limit imposed. However, the coming of Fred ZL2AMJ's "Tucker-Tin" SSB kit a few weeks before takeoff altered the outlook somewhat. Malcolm ZL2VO very kindly lent me a small sized seven valve receiver for 80 metres only and I altered one of my power supplies so that it could be switched from transmitter to receiver and vice versa.

The Sunderland arrived over the islands in perfect weather, bright sunshine and no wind. That evening, before tea I had reported to Jack Ryan ZL3VB (who is Superintendent of the Post Office at the Chathams) that I had permission to work portable on the island, obtained permission from the Hotel Chatham's management at Waitangi to erect an aerial, and managed to get the aerial up! I took my home aerial, a half wave, end-fed antenna, to the Chathams. The Hotel Chatham is situated on the waterfront at the foot of a small cliff. I found a convenient clothes line which was just about feeder distance from my bedroom window and on the top of the cliff was one of the hotel's radio poles which was also used as telephone pole. I thus strung the aerial from the clothes pole across the hotel roof to this aerial pole. As I still had 12 feet of aerial left I hung this across to a disused power pole.

Not many amateurs knew of me going to the Chathams for we did not have the means or time to get it out but it was only fit and proper that that the first contact should be Fred ZL2AMJ at 8.25pm Chatham's Time (which is 45 minutes ahead of NZMT). He, of course, was looking for me but soon also Ray ZL1ATQ and Col ZL1AGC joined in. I felt that it was sufficient to work these three friends on the first evening, and as I had been up since 4am in order to get to the Sunderland, was glad to turn in about 9.30pm.

On the second evening I had been invited out for the evening and did nothing but play about with the receiver. The third evening set the pattern for the future. For once the power generator behaved itself and I was able to work no less than ten different stations in New Zealand before the power went off at 10.30pm. Of course it could go off at any old time (sometimes it did) and this somewhat restricted radio hours especially from the VK angle, but I found I had very full evenings and sometimes was glad to get to bed.

I found radio reception conditions generally very good, much better than at home. In the early evenings the background of overseas stations was so loud it was difficult to sort out the ZL stations. The Ws on 80 metres cluttered up the band and only the strongest signals could be read through the interference. Static was average and bad rain static was experienced on two occasions.

We had several thrills. One came on 22 June when Ray reported that a VK4 had contacted him on 20 metres and had said that he had heard me among a group and he had felt he should not break-in. Ray disillusioned him as to this and asked him to come on that evening, and sure enough VK4RZ broke in on a contact I was having with Tom ZL2AHM. I worked several other VKs from the Chathams. The greatest thrill of all came on July 12th when, due to good shepherding of Ray ZL1ATQ and Dick ZL4OD, I worked Bill PZ1AX in Surinam, South America. *(Abridged)*

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D C Probine	Auckland	66	ZL1TND
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Radio Frequency Direction Finding – Part 1

Break-In *(July – August 2011) — By John Martin ZL1GWE / ZL1OOIBM*

This series is about High Frequency Direction Finding systems which, during WWII was called Huff Duff systems or HFDF. Why this interest, one might ask? In order to catch an intruder, one has to understand the technology and associated techniques, they use. The very technology used in Over the Horizon Radar (OTHR) systems, for instance is actually used for the detection and location of ships and aircraft for defense purposes is in fact a form of sophisticated direction finding system.

When I originally started investigating the subject of direction finding, I discovered there was a great history and related technologies. I found in order to fully understand the different techniques being used, and the associated concepts, it was necessary to explain the concepts clearly to a whole range of readers. Direction finding by itself appears to be simple, but when one realises the associated requirements and complexity of direction finding (DF) systems, this requires a broad theoretical foundation and more than ever the ability to apply it to practical situations. Direction finding is an interdisciplinary field, and its superstructure in signal theory falls in the field of arrays and signal processing. Some of the areas, needed to fully understand its capability lie within the following areas: antennas and wave propagation, radio frequency (RF) circuitry technology, data communications, software engineering, and the like are also essential. It is hoped that understanding the different techniques will assist many and perhaps propel others to a career in radio or even towards becoming a RF Engineer and assist others to experiment and also contribute to the defence of our precious radio spectrum we seek to protect.

Where does one start? I asked myself that very question, when starting out on this journey and where does it end, if at all.

In this day and age, why an earth would one want to discuss Direction finding systems? Let's look at the application of Direction Finding systems, and you will see that they are very much alive and used within everyday electronics in a variety of interesting areas.

Application of Direction finding systems[1]

- Radio Navigation and satellite global Positioning systems eg US satellite Global Positioning System (GPS) or Russian Global Navigation Satellite (GLONASS) provide time of arrival signals for measuring precise geolocation and velocity
- Search and Rescue services eg terrestrial and satellite DF networks are used to continuously locate emergency signals.
- Signal direction finding and location systems eg these systems operate throughout the radio spectrum from the HF band to 18 GHz for purposes that range from animal tracking to locating stolen cards to gathering military intelligence.
- Homing systems eg small DF systems designed to guide a weapon or artillery shell towards a location. Active systems use radar; whilst passive systems can DF target emitter signals (home or jam them).
- Warning systems, eg Electronic Support Measure (ESM) system, these are normally rapid response DF and identification systems to protect against hostile radars and homing systems.
- Radio astronomy eg large antenna arrays that can be synchronised into large interferometric systems spanning continents. The resultant radio maps shown density and velocity of natural signals from different states of hydrogen and various molecular energy states transitions.
- Smart antennas (known as adaptive array antennas, multiple antennas, with smart signal processing algorithms used to identify spatial signal signatures such as the direction of the arrival (DOA) of the signal, and use it to calculate beam forming vectors, to track and locate the antenna beam on the mobile/target.
- Illegitimate signals such as undesired emissions from an industrial facility or unlicensed base stations
- Signals to detonate improvised explosive devices eg advances in adaptive arrays or smart antennas provide spatial isolation of emitters, interference cancellation and resistance to multipath signal fading
- Tactical means of assessing potential threats from a military perspective
- Amateur Radio Direction Finding (ARDF or radio sport) is a radio direction finding activity, using orienteering techniques with a compass. The objective to find the transmitter, sometimes called "Fox hunting".
- Locating the source of pirates, intruding signals within the Amateur radio spectrum, this is my prime objective.

Modulation

So, let's commence with some first principles, starting with Modulation. The following is reproduced with permission of the. *RSGB Radio Communication Handbook,* 10th Edition[3].

A simple sine wave radio conveys no information except that it is there and perhaps the direction of its origin. This is important, if you are interested in the direction of signal such as a carrier (N0N). In order to convey information we must change the signal in some agreed way, a process called modulation.

The simplest form of modulation is to turn the signal on and off and this was all that early pioneers of radio could achieve. This led to the adoption of the Morse code (originally invented for line telegraphy) which remains very effective in sending text messages and is still practised by many radio amateurs although Morse has given way to other techniques in commercial applications. A Morse signal is shown in figure 1. It will be noticed that the edges of the carrier waveform are rounded off; the reason will be explained shortly in the section below. It is called CW or carrier wave because the carrier (the sine wave signal) is all that is transmitted. However, we know this is not quite correct.

Amplitude Modulation (AM)

In amplitude modulation, the amplitude of the carrier is varied according to the instantaneous amplitude of the audio modulating the signal as shown in figure 2. Only the carrier is transmitted in the absence of modulation, the audio (or other) signal increasing or decreasing the transmitted amplitude. The depth of the modulation, m, is given by the quantity B/A or B/A x 100%. It is desirable to achieve a reasonably high level of modulation but the depth must never exceed 100%. To

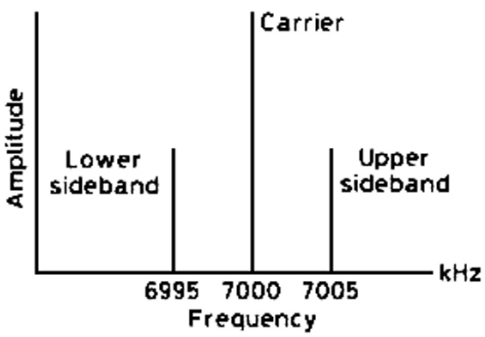

Figure 1. Amplitude Modulation.

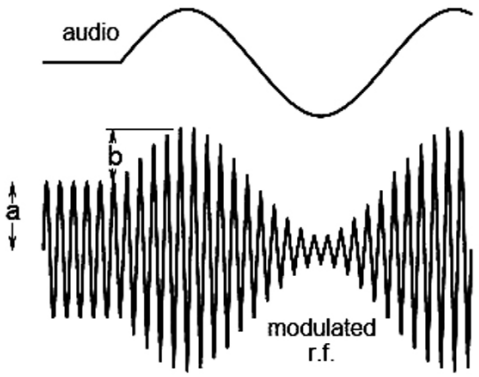

Figure 2. Sideband spectrum.

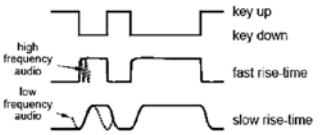

Figure 3. CW Keying signal.

do this will result in distortion of the audio signal, the production of harmonics and a transmitted signal that is wider than intended and likely to splatter over adjacent frequencies causing interference.

Sidebands

The process of modulation leads to the production of sidebands. These are additional transmitted frequencies each side of the carrier, separated from the carrier by the audio frequency. This is first shown mathematically and then the result used to demonstrate the effect in a descriptive manner.

A single carrier has the form:

$A \sin \omega_c t$

Where A is the amplitude and ωc is $2\pi f_c$, the frequency of the signal. When amplitude modulated the formula becomes:

$A(1 + m \sin\omega c_a t)\sin\omega_c t$

Where m is the depth of modulation and ωc_a the audio frequency used to modulate the carrier ωc_c. Expanding this gives:

$A \sin \omega c_c t + Am \sin\omega c_a t \times \sin \omega c_c t$

The second term is of the form sinAsin B which can be represented as

$\frac{1}{2}(\sin(A-B) + \sin(A+B))$, so our signal becomes:

$A \sin \omega c_c t + Am/2\{\sin(\omega c_c t - \omega a_c t) + \omega c_a t\}$

Inspection will show that these three terms are the original carrier plus two new signals, on at a frequency $f_c - f_a$ and the other at $f_c + f_a$ and both at an amplitude dependant on the depth of modulation but with maximum amplitude of half the carrier. This is shown in figure 3.

It might still not be that clear just why the sidebands need to exist. Consider the effect of just the carrier and one of the sidebands but as if they were both high pitch audio notes close together in frequency. A beat note would be heard. Add the other sideband, given the same beat note. The overall effect is the carrier varying in amplitude.

The bandwidth needed for the transmission depends on the audio or modulating frequency. The two sidebands are equidistant from the carrier so the total bandwidth is twice the highest audio frequency.

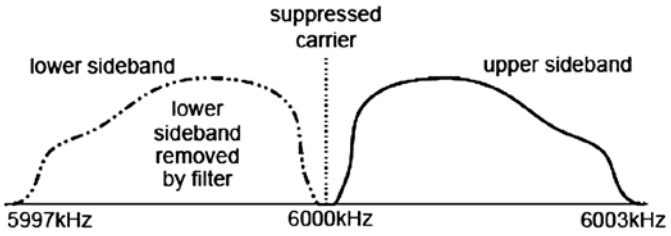

Figure 4. SSB signal with one sideband filtered out.

Modulating the carrier also increases the transmitted power. The formula above gave the amplitude (voltage) of the signal. If the power in the carrier is Pc then the total transmitted power is:

$PC + 2 \times Pc\ (m/2)^2 = Pc\ (1 + m^2/2)$

For 100% modulation, the total transmitted power is 150% of the carrier power, that is the carrier plus 25% in each sideband.

It can now be shown why the keying of the Morse signal was rounded. Morse can be regarded as amplitude modulation with only two values, 0 or 100% modulation. Simplistically, there would be sidebands separated from the carrier dependant on the keying speed. That is not the whole story however.

The rise and fall of the transmitted envelope greatly affect the overall bandwidth. Figure 4 shows the Morse keying with fast and slow rises and falls of the keying and thus the transmitted RF envelope. The fast rise can be regarded as a small part of a high frequency audio signal. The sidebands at the moment of keying will be those applications to 'audio'. The bandwidth will be much wider than that assumed from the Morse speed alone. A well designed keying circuit is inaudible outside the tuning range over which the Morse tone can be heard. Bad keying causes 'key clicks' that can be heard several kHz each side of the Morse signal proper. It should be avoided.

Single Sideband (SSB)

Figure 5 below shows an AM signal where the audio is speech containing a range of frequencies from just above zero to 3 kHz. The upper sideband is a copy of the audio, albeit shifted up in frequency to just above the carrier, and the lower sideband is a mirror image just below the carrier. In fact all the audio information is contained in the sidebands; as stated at the very beginning, the carrier contains no information. We can, therefore, dispense with the carrier and either one of the sidebands. In figure 5, the lower sideband is shown as filtered out and the carrier has been suppressed.

The modulation and detection techniques needed to do this for receivers and transmitters are complete subjects on their own and are not covered here.

SSB transmission requires only half the bandwidth and represents a considerable saving in power, as evidenced by the formula for the power in the various components of the AM signal above. It will be recalled that the frequency of the audio signal was retained in the transmitted signal by the frequency separation between carrier and the sideband. If the carrier and the other sideband are removed the reference point for determining the audio frequency is lost. It is 're-inserted' at the receiver by the act of tuning the signal. The receiver must be accurately tuned or all the received frequencies will be offset by the same amount, namely the error in the tuning. This is why the pitch of the audio of an SSB signal varies as the receiver is tuned.

The bandwidth of an SSB signal is simply the audio bandwidth, half that of the AM transmission. The power varies continuously from zero, when unmodulated, to its peak value depending on the audio volume and the designed power of the transmitter.

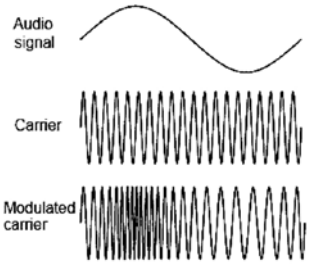

Figure 5. Frequency Modulation signal.

Frequency Modulation (FM)

In FM, the instantaneous frequency of the carrier is varied according to the instantaneous amplitude of the carrier as shown in figure 6. Unlike AM there is no natural limit to the amount by which the frequency may be deviated from the nominal centre frequency. The peak deviation is a system design parameter chosen as a compromise between audio quality and occupied bandwidth. The ability of an FM detector or discriminator to combat received noise increases as the cube of the deviation. However, the total received noise increases linearly with the bandwidth so the overall effect is a square law.

For instance, doubling the deviation and bandwidth improves the recovered audio signal to noise ratio by a factor of four (6dB).

For FM the deviation ratio, corresponding to the depth of modulation of AM, is defined as:

Deviation ratio = actual deviation/ peak deviation

The modulation index related the peak deviation to the maximum audio frequency:

Modulation index = peak deviation/audio frequency

A narrow band FM system is one where the modulation index is equal or less than unity. Amateur FM systems are narrow (NBFM). 2m, with 12.5 kHz channels, the max audio frequency is around 2.8 kHz and the peak deviation 2.5 kHz

continued on page 6

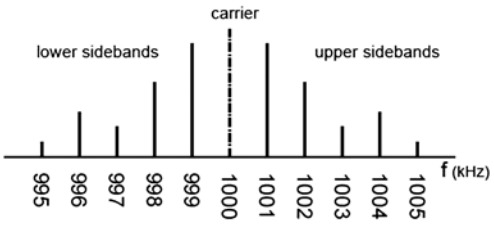

Figure 6. Spectrum of an FM signal.

◂ continued from page 5

a modulation index of 0.9. At 70 cm, with 25 kHz spaced channels, the calculation is 5/3.5, a modulation index of 1.4.

VHF broadband stations have an audio range up to 15 kHz and a peak deviation of 75 kHz, given a modulation index of 5. This is a wide band FM system (WBFM). TV sound has a deviation of 50 kHz but good quality TV sound systems now use the NICAM digital sound channel which also offers stereo reproduction. Simplistically, the modulation index will give a guide to the audio quality expected.

The bandwidth of an FM transmission is considerably wider than twice the peak deviation, as might be expected. The modulation gives rise to sidebands but even for a single audio modulating tone, there may be several sidebands. The mathematical derivation is much more complex and the 'sin' function requires Bessel functions to calculate. The formula is:

$A \sin(\omega c_c t + M \sin \omega c_a t)$

Where m is the modulation index.

This gives a transmitted spectrum shown in figure 6 which has, theoretically, an infinite number of sidebands of decreasing amplitude. The rule of thumb often applied, known as Carson's rule, is that the necessary bandwidth is given by:

Bandwidth = 2 (peak deviation + maximum audio frequency)

For a typical 2m system this works out as:

Bandwidth = 2 (2.5 + 2.8) = 10.6 kHz

Carson's law tends to over estimate the required bandwidth at the lower modulation indices used by 12.5 kHz channel systems. In practice, a receiver filter with a bandwidth of around 7.5 kHz will prove adequate, and also filter out more of the ever present RF noise.

The number of relevant sidebands depends on the modulation index, according to the graph in figure 6. This shows the carrier and first sidebands.

Phase Modulation (PM)

This is a subtle variant of the frequency modulation. In FM, it is the instantaneous frequency of the transmitter that is determined by the instantaneous modulating input voltage. Clearly, as the frequency varies, the phase will differ from what it would have been had the carrier been unmodulated. These are phase changes but these are as a consequence of the frequency modulation, it is the phase that is directly controlled by the input audio voltage and frequency varies as a consequence.

Frequency modulation is usually achieved by a variable capacitance diode in the oscillator circuit. This has the side effect of introducing another source of frequency drift or instability.

Digital Modulation

The techniques of digital modulation are little different, except modulating the input will normally comprise a data signal having one or two discrete values, normally denoted '0' and '1' but in practise two different voltages.

Amplitude shift keying, that is two different amplitudes, either of the carrier or of an audio modulating signal is uncommon, partly because nearly all interference mechanisms are amplitude related and better immunity can be achieved by other methods.

Frequency shift keying is popular, the carrier having two frequencies separated by 170 Hz for narrow shift or 450 and 750 Hz wide shift typically used commercially. The occupied bandwidth is again greater than the frequency shift since each of the two 'carriers' will have sidebands depending on the keying speed and method. The mode can be generated either by direct keying of the modulator or feeding audio tones (1275 and 1455 Hz for narrow shift amateur use into an SSB transmitter.

Phase shift modulation is used in many amateur modes. Two phases, 0° and 180° may be used. This is binary phase shift keying, BPSK. Another method, known as QPSK, quadrature phase keying has 4 states of phases; 0°, 90°, 180° and 270°. This allows two binary digits (each with two states 0 and 1, (giving four in total to be combined into a single character or symbol to be sent. By this means the symbol rate (the number of different symbols per second) is lower, half in this case, than the baud rate, defined as the number of symbols per second. Each symbol may be advanced by 45o in addition to the phase change required by the data so that, irrespective of the data, there is always some phase change. This is needed to ensure the receiver keeps time with the transmitter. If this did not happen and the data happened to be a string of 20 zeros with no phase changes, there is a risk that the receiver would lose timing and output either 19, 20 or 21 zeros. It is then out of synchronisation with the transmitter and the output data signal may well be meaningless. Higher level modulation schemes can combine even more binary digits into a symbol, allowing even higher data rates. Quadrature Amplitude Modulation (QAM) is used professionally but not often in amateur radio circles. Whilst higher data rates are achievable, the difference between each symbol gets progressively less and less as each symbol is used to contain more and more binary bits. Figure 7 shows that these systems diagrammatically. In isolation this is all very well but the effects of noise and interference get progressively worse as the complexity of the system increases.

What is Phase?

The phase of an oscillation or wave refers to a sinusoidal function: The phase of an oscillation or wave refers to a sinusoidal function such as the following:

$x(t) = A \cos(2\pi ft + \theta)$
$y(t) = A \sin(2\pi ft + \theta) = A \cos(2\pi ft + \theta - \pi/2)$

Where A, f, and θ are constant parameters. These functions are periodic with Period $T = 1/f$, and they are identical except for a displacement of $T/4$ along the t axis. The phase is the term $(2\pi ft + \theta - \pi/2)$.

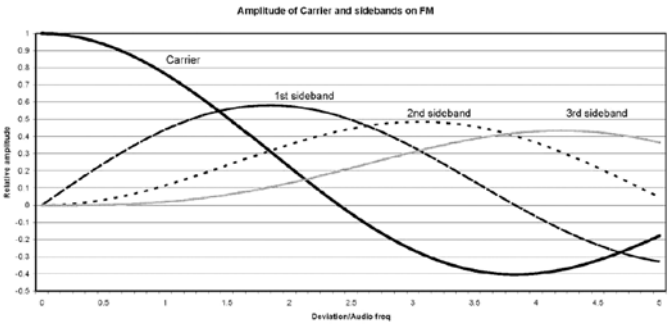

Figure 1 Relative Phase.

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[1] Antenna Engineering Handbook, 4th edn by John L. Volakis (ed) McGraw-Hill @2007

[2] <http://en.wikipedia.org/wiki/Phase_%28waves%29>

[3] *Radio Communication Handbook* 10th Edition RSGB ISBN 9781-9050-8654-2

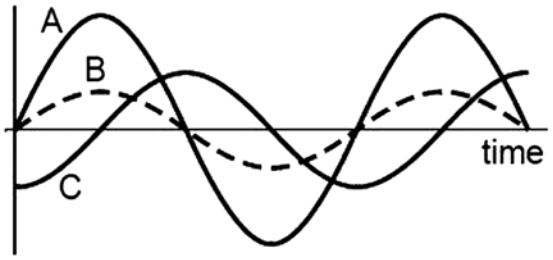

Figure 7. Amplitude of carrier and sidebands given by Bessel function.

MEMO to *Break-In* contributors

CDs:

Nowadays many contributors are sending me graphics and photos, etc on CD and this is much appreciated. At present the cost of a CD is less than the postage costs so, unless requested otherwise, they will not be returned. Please let me know asap if I still have a CD or photo that you would like returned and I will action. Thanks, *John ZL3IB Editor*

Professional Amateurs

by John Andrews ZL2HD

One of the questions I get asked a lot (and I guess most readers of Break-In *do) is why is it called Ham radio or Amateur radio? "I don't know the answer to the Ham part," I say "and the amateur part is because we do radio as our hobby, not as a job, but in many cases it is also our career, or at least technology is a big part of our jobs." I like to add that it is not only radio, but any technology, as when the hobby really got going (up until computers became common) radio was the most exciting, leading edge technology around, and technically inclined people gravitated towards it; as many do today towards computing.*

With the recently signed co-siting agreement with Kordia I have been talking to amateurs who work as professionals with radio and technology in Kordia. I found it interesting to hear about how they became involved in amateur radio and how the hobby has helped them in their careers and the professional training in Kordia (and in its previous guises) has rubbed off in their hobby and general interest in technology.

Why would you be interested? I think being able to give good case studies of how professional and amateur go together are good when getting potential amateurs to take the step and get involved in our hobby, and shows that the hobby is current and relevant.

Michael Taylor ZL1MT became a radio amateur not long after he started working for Broadcasting (now Kordia) in Auckland soon after leaving school. It was during his training that he met amateurs and this allowed him to follow up and get his licence. With the enthusiasm from his hobby flowing into his work, Michael is sure that he was in the right career. Michael's current role at Kordia has seen him re-locate to Wellington to work in the Transmission Control Centre at Avalon, where he is part of the team responsible for ensuring that Kordia's core network is operating at the amazingly high levels of availability that broadcast transmission requires. Michael explained that Kordia's core Integrated Services Network is state of the art, with Kordia being among the first NZ adopters of the MPLS technology that underpins the high speed, high availability IP network. Traditionally this has carried the bulk of radio and TV transmissions around NZ but now that has expanded considerably to include many data and telephone customers too. Not so long ago this was done exclusively with microwave radio links but the huge demand for bandwidth, and the many new services that Kordia is providing, require many times the original capacity and this is now also met with fibre, which has increased the protection against single points of failure.

Not just TV any more

The major challenge that Michael enjoys as a professional is keeping the Kordia core network operating for the day to day business of TV and other services, as well as adding in the special events and new services. The best example of this is the Rugby World Cup which requires diverse links from the venues to the studios and then to the transmitters or satellite uplinks. This has required a huge investment in new hardware that can go to all the remote sites as needed and then to provide the links to the other broadcasters that are here to cover the event. It is not just a one time setup: the hardware that goes onsite (the encoders that convert the programme to digital traffic) needs to be moved around and integrated into the network at different places as the games move around. Michael describes this as the biggest and most interesting work he has done so far, and a bit like running a new field day site every couple of days!

With many people expected to be watching the games, Michael believes this is a real showcase of what Kordia can do.

While Michael has moved into technology management at work, he has also reflected this in his amateur experience as well. Michael worked as part of the team that constructed the Auckland VHF Group's Klondyke site. Michael spent his time co-ordinating, recruiting and following up the amateurs (plus the tools, hardware and parts) to do the huge amounts of work that are required at such a complicated site. Definitely a case of being the professional amateur!

While Michael is working on the core of the Kordia network Gary ZL2VL is closer to the customer with his Kordia job in Content Services. Gary also became a licenced amateur soon after starting his career in broadcasting and just as amateur technology has changed over the last 40 years, so has the exciting technology he has dealt with in Kordia. 2011 is a particularly exciting year for Gary as he is working in the team that supports the customer in getting their programme from the venue to the end user. And with RWC 2011 that is changing nearly every day.

Gary worked closely with the Kordia customers and partners (such as SKY®) to map out what was required and how it was to be delivered. This ended up being a mix of fibre, microwave, satellite links, lots of expert staff, and a carefully designed program to move them around. While he was particularly interested in microwave, Gary explained that the Kordia core network's wide reach made it better to use more fibre and fill the gaps with satellite with only some microwave. Not that radio is out of date, but with high definition TV and multiple feeds you need many strings to your bow and the investment in fibre pays off at times like this.

Linking the profession to the hobby

Gary's experience in broadcasting has covered from AM transmitters through TV transmission and broadcasting, digital TV, IP based data services and everything in between. What has that got to do with ham radio? Plenty, as Gary worked on the UHF National System when it was extended across from Mt Taranaki to the Hawkes Bay via Wharite, a good match of his work experience as well as building new experience to use back at the office or in the field during the work week.

Gary has been an active amateur and NZART member, spending much time participating in VHF contesting. Visiting hill tops to set up for a weekend was a lot like what he did at work, and Gary says his work certainly gave him the "can-do and know how" approach that made the hobby a lot more fun. He says being technology aware from being a radio amateur gave him technical understanding and a wide range of problem solving skills that enabled him to learn fast at his job and to take on new challenges when required. What boss wouldn't want a good keen, competent person in their team?

Kordia is a great example of the type of successful organisation that values the amateurs that work for them and has benefited greatly by having amateurs working for them. The amateurs at Kordia have exciting careers and Kordia, as a major supporter of amateur radio in New Zealand is ensuring that amateurs will continue to develop the skills and enthusiasm that make this a great hobby. Kordia currently hosts amateur repeaters at 11 of its sites and has made others available for us to use if needed. Many of these are key sites on the National System and without them would require many more intermediate stations to get the coverage we enjoy (and that means more licences, repeaters and sites). By working with Kordia we can concentrate on adding new sites and making sure we get the most out of our hobby rather than rebuilding at other locations.

While you might not hear Michael ZL1MT or Gary ZL2VL on the air as much today as you did in the past, you can bet they are keen radio amateurs and NZART members and proud to be broadcasting professionals at the same time and very much "on the air" at work.

What a great story to show why the hobby is still a great way to spend you time! βi

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Use of Ferrites and Filters to solve EMI Problems; Part 1 of 2

by David Conn VE3KL

(Reprinted from The Canadian Amateur, *July/Aug 2010)*

Introduction

Radio Frequency Interference (RFI) or Electromagnetic Interference (EMI) has always been a serious issue for the radio amateur. In the past, most of the interference was related to our transmitter interfering with weak signals that were received on television sets. However, with the explosion of low voltage electronic devices in our life, we now experience more and more interference to and from our radios.

Note: This article uses TCA HotLinks to provide access to enriched media from the RAC website. For more information, please go to <www.rac.ca/tca July/Aug>.

Interference from our radio transmitters is usually caused by using unbalanced antennas that do not use a proper Balun to prevent RF from flowing into the Ham Shack. Once the current enters the house it can be received by all of the electronic systems which are connected by wires and cables that act just like receiving antennas. Hence, we have two problems to deal with. First, we must minimise the amount of RF in the house. This cannot be set to zero with practical components, so we must also takes steps to reduce the receiving antenna characteristics of our electronic systems. The systems that are associated with our radios are: electronic keyers, computer controlled radios and their interconnecting cables, sound cards and their interconnecting cables, and any other piece of equipment that uses cables to connect to the system. Other systems that can be interfered with are telephone and audio systems that often are not designed with any thought of EMI.

Electronic systems in the house can also interfere with our radio receivers in exactly the same way as our transmitters. The noise generated by these systems, radiate with the same antenna action as they receive. The solution for these problems is the same: we must reduce the radiation from the cables that interconnect these systems. An example of a system that can interfere with our radios is a router that is connected to a computer via a cable system.

However, the electronic devices that we use respond to the square of the interfering signal which means that for every dB that we reduce EMI, the interference at the output reduces by 2 dB. So, a 10 dB reduction in the actual interfering signal results in a 20 dB reduction to the interference. This means that a moderate reduction in EMI levels returns big benefits to us.

This two part series, outlines a logical method for you to understand and solve these problems using simple components; ferrites, capacitors and the use of twisted pair wiring instead of coaxial cables for the connection of our systems.

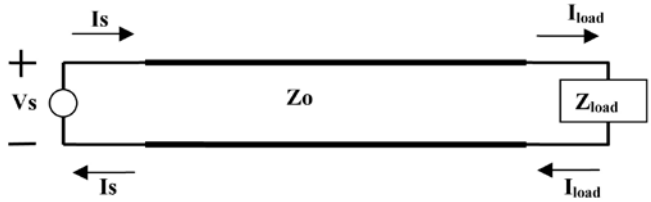
Part I of this series discusses the basics that are needed to solve EMI problems while part II presents practical methods that you can follow to find out what your particular problems are and how to solve them.

Part II also describes a simple experiment that you can construct to demonstrate many of the essential elements of EMI. It makes an ideal demonstration of EMI principles for club meetings and Hamfests.

Part I concentrates on basics including a short tutorial on ferrite devices which are used extensively to reduce EMI problems. Not all of these problems can be completely resolved using ferrites since some equipment ranging from microphones to radio receivers are not designed to suppress received interference or to reduce radiation to other systems. The classic demonstration of poorly designed equipment is the Pin 1 Problem, (See TCA Hotlink, 1) where a simple error of wiring can play havoc with audio systems such as microphones.

To solve EMI and antenna matching problems, we must first understand some of the fundamental concepts (see TCA Hotlinks, 2 and 3). The most important concepts are:

- Current flows in a closed path (loop) sometimes including real ground (earth) and you must visualise this in your system. Remember that Kirchoff's current law states that the total current flowing into a closed surface must be equal to zero. If you use a ground stake for an antenna, the current does not simply disappear into the earth. It returns to your transmitter via a loop that must be determined. This loop can include the power distribution of your house and/or capacitive coupling. The loop can also include passing by or into your audio or telephone system. Often, it is much better to use a floating system that is not connected earth except for lightning protection. I always use a floating system for my portable applications.
- This path can include noise sources that might interfere with your system.
- The enclosed area of the loop determines how much coupling there is to external signals.
- Transmission line differential mode propagation (usually wanted as our mechanism for power transmission).
- Transmission line common mode propagation (usually unwanted and a source of interference). It is essential that we spend some time studying this problem as it is one of the most important sources of EMI. Sometimes, EMI can take the form as both common and differential modes. This makes diagnostics slightly more complex but simple tests can be performed that tells us if there is a differential mode problem.
- The role of ferrite devices and capacitive filtering in the overall solution of EMI.



Key Ideas: **This is the normal way to use a transmission line.**
Input current, Is, equal and opposite.
Output current, I_{load}, equal and opposite.
A voltage, Vs, is applied across the line.
No return path or ground for current is needed.

Figure 1. Differential mode. The normal use of transmission lines where all of the current is carried by transmission line waves inside the cable.

Transmission line basics … Differential and common modes of propagation

Most of us are familiar with coaxial transmission lines such as RG8-X cable that we use to connect our transceivers to antennas. We transmit power to the antenna by sending signals inside the cable which does not radiate any unwanted power. This method of transmission is called a Differential mode where there is a voltage between the outer and center conductor (see Figure 1). It is called differential because there is a voltage difference between the outer and inner conductors. Also, the current that flows on the inner conductor is equal and opposite in phase to the current flowing on the outer conductor. The cable does not radiate because of this opposite direction of the current flow. This mode is also called the Transverse Electromagnetic Mode (TEM). In this mode of transmission we use terms such as characteristic impedance, velocity factor and matched loads. It is the bread-and-butter mode that we use for all of transmission systems.

There is another mode of propagation on the coaxial cable. It is called Common mode. In this mode there is no voltage between the conductors. Current can flow on the conductors along the cable but the currents flowing in the two conductors are in phase and hence they radiate power just like a wanted antenna.

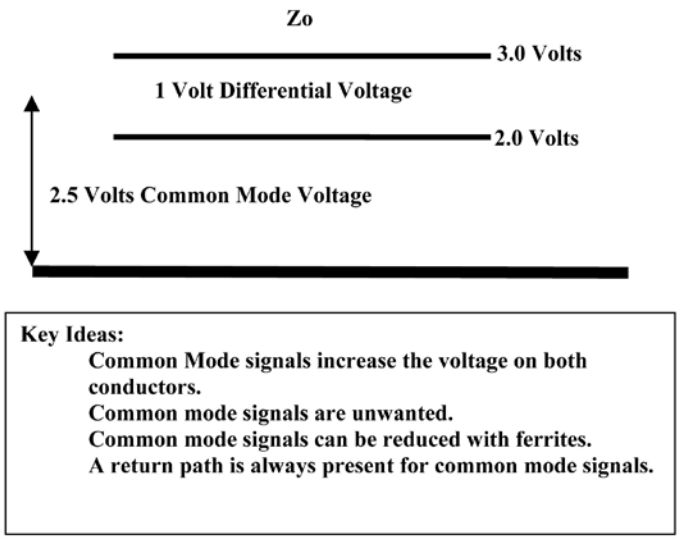
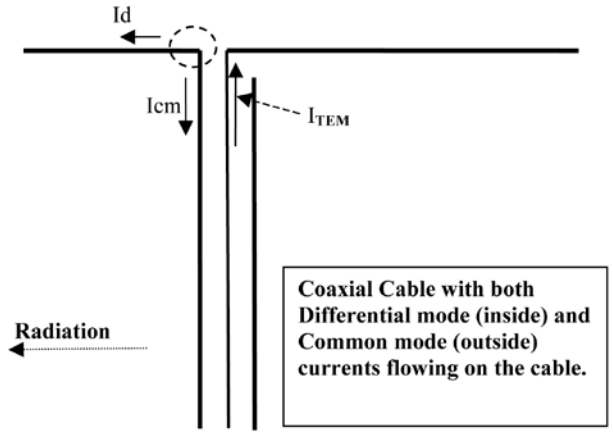

Zo
3.0 Volts
1 Volt Differential Voltage
2.0 Volts
2.5 Volts Common Mode Voltage
Key Ideas:
Common Mode signals increase the voltage on both conductors.
Common mode signals are unwanted.
Common mode signals can be reduced with ferrites.
A return path is always present for common mode signals.

Figure 2. A simple example of Common Mode signals added to Differential mode signals. In this case, both lines of the cable are elevated by a common mode signal of 2.5 V that is superimposed on a 1.0 V differential mode voltage.


Id
Icm
ITEM
Radiation
Coaxial Cable with both Differential mode (inside) and Common mode (outside) currents flowing on the cable.

Id + Icm = ITEM (Kirchoff's Law)
Id = dipole current
Icm = common mode current on outside of cable
ITEM = differential mode current on inside of cable

Figure 3. Common mode current caused by an unbalanced dipole antenna. In this case, both Differential mode (good) and Common Mode (bad) currents flow on the transmission line. The Common mode current radiates RF power and can travel into the Ham Shack.

The basic idea of common mode transmission is shown in Figure 2. The figure shows a transmission line that can be coaxial, twisted pair or another type that has two signals imposed on it. The diagram also contains an essential element for carrying unwanted common mode signals : the *ground* or *chassis* of the system. In this example, the common mode signal is set to 2.5 volts DC and the differential mode signal (across the transmission line) is set to 1.0 volts DC. The common mode signal essentially elevates the whole transmission line (both conductors by 2.5 volts). In general, the signals can be either AC or DC values and the situation is more complex than the simple example shown here. The definition for common mode signals is:

$$V_{cm} = (V_1 + V_2)/2$$

Where: V_1 is the voltage with reference to ground or chassis on one wire of the cable and V_2 is the voltage on the other wire, measured at the same position (usually at one end). In our example V_{cm} = 2.5 V.

Some of our examples use coaxial cables where common mode currents flow on the outside of the cable and very little flows on the inside. Hence the cable radiates power like an antenna. This is usually an unwanted situation, especially if the cable is inside the Ham Shack.

The source of common mode signals

The most significant source of common mode signals is due to our unbalanced antennas. Even very carefully constructed ones are not perfectly symmetrical. This source of common mode signals provides us with a very good example to study since we all face this issue with our antennas and also because the method of solving this problem is exactly the same that we use for all other common mode problems including the use of EMI power line and telephone filters.

Figure 3 shows how common mode currents can be generated by a simple dipole antenna. The antenna in this case is not balanced as it is not fed at its center. The total current that is carried by the outer conductor of the coaxial cable consists of common mode current and differential mode current. At the top of the antenna, the current flowing into the dipole, *Id*, plus the common mode current *Icm* equals the differential mode current, *ITEM*. Notice that if the short section of the dipole is reduced to zero length, Id goes to zero and then *Icm = ITEM*. This means that all of the current flowing to the antenna on the inside of the coaxial cable is transferred to Icm on the outside of the cable. This means that the radiation from this antenna consists of current flowing on one element of the dipole and current flowing on the outside of the coaxial cable. There is also capacitive coupling between the antenna elements and the coaxial cable as shown in Figure 3.

Other sources of common mode signals include the difference in ground potential between a signal generator like a router and its receiver, a computer. The resulting common mode current radiates power that our radio receivers can pick up.

Once we understand that common mode signals must be suppressed and/or diverted away from our radio stations, it is then necessary to find out how to solve the problem. Usually this involves the use of ferrite chokes and /or capacitor filters.

Like all closed paths (loops), a high impedance placed in series with the path will reduce the unwanted current and this is where ferrite chokes play a major role. The next section presents the basics of ferrite devices. Differential mode noise can usually be solved by placing RF capacitors across the interfered device.

Ferrite basics

Ferrites are ceramics that are made in many forms. They consist of metal oxides that are produced to have a very high permeability. Iron, manganese/zinc (MnZn) and nickel/zinc (NiZn) are commonly used to produce these materials. Ferrites that we use for EMI suppression and antenna matching are called "soft ferrites" that are not used for permanent magnets.

The basic idea is that winding a coil on a ferrite material increases the value of the inductance by a very large amount compared to the self-inductance of the same coil with no ferrite being used. In many cases the permeability of the ferrite is around 2000 at low frequencies. For our uses, we must also note that ferrite materials are lossy and produce resonance characteristics, both of which can help/hinder us in specific applications.

Manufacturers of ferrites for radio applications vary the chemical composition of the mix, to achieve some desired characteristics such as high permeability at VHF or other frequencies.

Figure 4 contains a photograph of several ferrites devices that are commonly used for EMI suppression methods. The Clamp-On types made from #31 mix from Fair-Rite® are easy to use, especially for diagnostics.

To demonstrate the use of ferrite material, a Round Cable EMI Suppression Core from Fair-Rite is used throughout this series. The core is made from a broad band material #43 that works well from 1 MHz up to 250 MHz. It has a low frequency permeability of 800 which makes it ideal for EMI suppression applications.

The characteristics of Mix #43 from Fair-Rite corporation (see TCA Hotlink, 4) are presented in Figure 5. This graph shows that there are two parameters involved. Ferrites increase the permeability (inductance) but also have built-in losses (resistance) that always influence the circuit parameters. The real part of the permeability is called µReal . This portion defines the inductance of a circuit. The imaginary part of the permeability is called µImaginary and this portion determines the resistance of the circuit.

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continued from page 9

Figure 4. Photographs of Ferrite and Capacitor components that are used to make EMI filters.

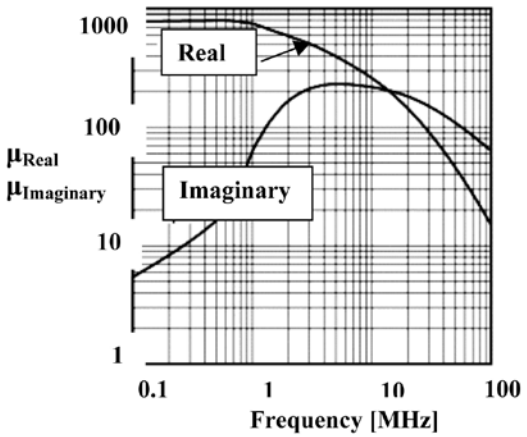


Figure 5. Permeability characteristics of #43 mix from Fair-Rite.

Figure 6 shows the measured impedance of the round Ferrite EMI filter shown in Figure 4. The impedance was measured by winding a one turn coil of wire through the core. Notice that as the frequency is varied from 1 to 181 MHz, the equivalent circuit consists of a resistance, *Rp*, in parallel with a positive reactance, *Xp*. Both vary with frequency and *Rp* is much smaller than *Xp* over most of the frequency range. The absolute value of the impedance is less then 300 Ohms throughout most of the frequency range and much less for the HF band. This is not high enough to make a good common mode HF filter. The solution for this problem is to add more cores in series as discussed in part II of this series.

Capacitor basics

Capacitors are also used to solve EMI problems. They are often called bypass capacitors. Like ferrites, capacitors are not ideal devices. A real capacitor includes device inductance and power dissipation so we cannot simply select a very large capacitor to provide an RF ground. We must also consider the type of capacitor material, the break-down voltage and the frequency band that requires the capacitor. EMI at 430 MHz requires a much different capacitor solution than EMI at HF bands.

One example of the performance of a capacitor is shown in Figure 7, where the impedance of a good 1000 pF ceramic capacitor with a 50 V break down voltage is presented. The total impedance of a by-pass capacitor should less than approximately 2 Ohms at the operating system. The 1000 pF capacitor used here is ideal for use in the 2 metre band where the series resistance is approximately 0.3 Ohms and the series reactance is approximately -0.33 Ohms. However,

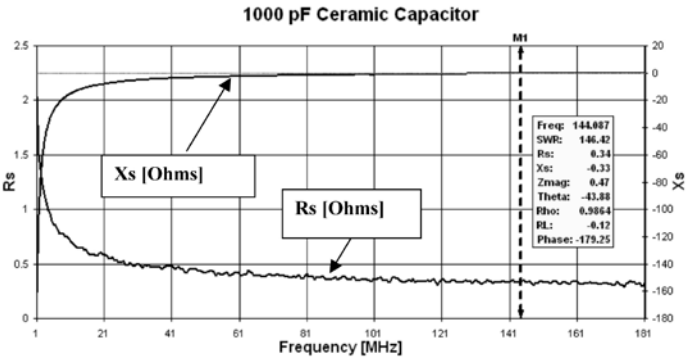


Figure 6. Measured characteristics of #43 Round Cable Core (Part # 264350002 from Fair-Rite). Measurements made by VE3KL using an AIM 4170 vector network analyzer.

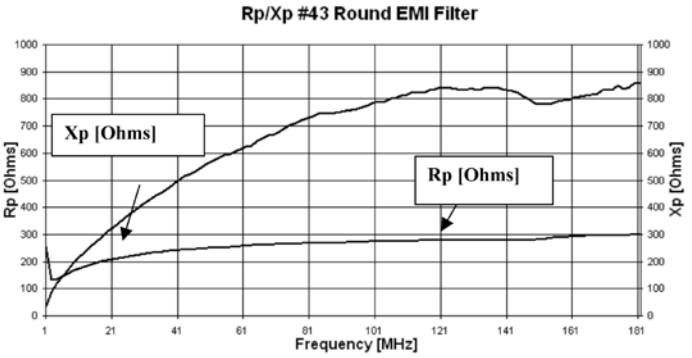


Figure 7. Measured characteristics of a 50 V 1000 pF ceramic capacitor. Measurements made by VE3KL using an AIM 4170 vector network analyzer.

it is not suitable for the HF band where the impedance is quite high. This capacitor does not display any significant inductance for frequencies below 180 MHz. Hence the capacitor does not have a series resonant frequency in this band.

Conclusions and further study

It is very clear that most amateurs at all levels struggle with EMI and EMI problems with their radio systems. The problems that I hear about all the time range from the new Ham who buys a nice radio and connects a long wire antenna to its terminals to get a quick start. The outcome is very predictable: there is massive interference to his/her home electronic systems, telephones and computer displays. However, it most cases, this experience encourages them to find solutions to their EMI problems and get on with working DX. More experienced amateurs struggle with the very difficult problems associated with mobile operation.

Part I of this series presented the basic building block ideas that are needed for solving EMI problems. Part II of the series provides practical methods that you can and should be using in your radio station as well as describing a very simple experiment that you can build to explore many of the concepts presented in this series.

Further study using TCA Hotlinks

Further information is provided with TCA hotlinks which are easily accessed via the RAC website. For this information, please visit <http://www.rac.ca/tca>. Hotlinks make it unnecessary to type URL addresses into your computer and provide you with calculators and other support that demonstrates the ideas presented in the articles. The following hotlinks for this article are available on the RAC site.

TCA Hotlink, 1
The Pin 1 Problem <http://pin-1problem.com/>

TCA Hotlink, 2
A Ham's Guide to RFI <http://www.audiosystemsgroup.com/RFI-Ham.pdf>

TCA Hotlink, 3
Understanding Common Mode Signals <http://www.maxim-ic.com/app-notes/index.mvp/id/2045>

TCA Hotlink, 4
Fair-Rite Data Sheets <http://www.fair-rite.com/newfair/index.htm>

Until later, VY 73,

David, VE3KL

ARISsat-1. The latest amateur radio satellite

by Alan Cresswell ZL2BX

ARISsat-1 was launched from the International Space Station on 3 August 2011. The launch was performed by two Russian crew members who simply threw it off into space. It is in a slightly lower orbit than the ISS and so has a slightly shorter orbital period and is therefore slowly drifting ahead of the ISS. It is designed to stay in orbit for about a year before it re-enters and burns up. The purpose of ARISsat-1 is "To promote Science, Technology, Engineering, and Mathematics (STEM) education around the world." It has many interesting features. There is a 70cm to 2m transponder and a 2m FM downlink transmitting pre-recorded messages, voice announcements of satellite operational parameters and slow scan TV. A separate 2m channel transmits operating parameters in CW and a BPSK-100 data stream. With such a busy satellite there is something for everyone.

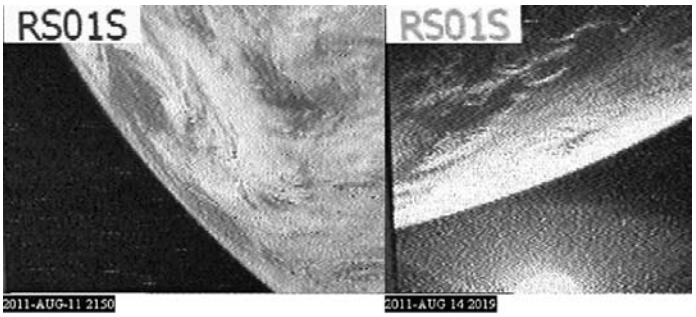


Figure 1. SSTV taken over New Zealand.

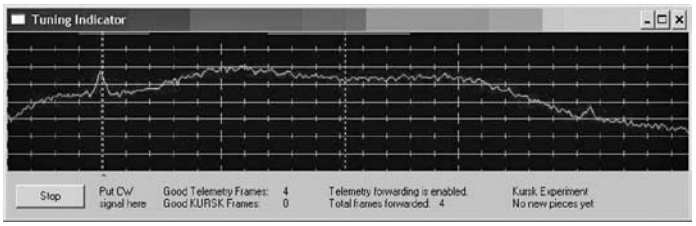


Figure 2. The BPSK-100 tuning indicator.

Operating modes

ARISsat-1 has limited battery capacity so switches to a "Low Power" mode in eclipse or whenever solar input is marginal. In this mode the satellite transmits for about 40 seconds every two minutes. Once the battery has charged up sufficiently it switches to "High Power" mode and the satellite then transmits continuously.

The 70cm to 2 m transponder 435.750 up, 145.930 down

Unfortunately as the satellite was being maneuvered through the airlock prior to launch the 70cm antenna was broken off. This left a very short stub apparently less than 3 cm long as the uplink antenna. As a result communication through the transponder is marginal to say the least. The plan was to enable users with hand held equipment to use the transponder but unfortunately it now requires reasonable power and considerable antenna gain. Nevertheless communication is possible and I have had a few VK contacts through ARISsat-1.

The FM channel 145.950MHz

The FM channel is probably the most interesting one and can be received easily with almost any 2m station. It cycles through a range of activities. As part of the educational outreach there are 24 different greetings from children in 15 different languages. The greetings end with a "secret word" and children who send off the secret word to AMSAT receive a certificate. As well as the children's recorded messages there is a short segment (in Russian) of Yuri Gagarin communicating with ground control during the first manned space mission. A computer generated voice provides some basic operating parameters such as temperatures, battery voltage and battery current drain. The sequence finishes with an SSTV image before the cycle repeats but with different messages.

SSTV

Every two minutes an SSTV image is transmitted on the FM channel. There are four cameras on board all looking in different directions. Each image has a colour-coded header to indicate which camera has produced the image. The quality of the images varies from somewhat noisy to excellent depending on such things as the pass elevation, the amount of fading etc. After the four cameras have cycled through the next image is one of two standard images. The camera cycle then repeats. So far I have received more than 100 SSTV images. Figure 1 shows two of the images taken over New Zealand.

The telemetry channel; BPSK-100 145.920 MHz

The telemetry channel transmits a BPSK-100 signal and a CW signal. The CW carrier is displaced 1 kHz below the telemetry carrier. This composite signal is designed to fit into the standard SSB receiver passband. Demodulating software for the BPSK-100 telemetry is available from the AMSAT website <http://www.amsat.org>. The BPSK-100 demodulator requires that the telemetry signal be placed close to the centre of the passband at 1500 Hz. This is where the CW signal comes in. By adjusting the tone of the CW signal to 500 Hz the telemetry is automatically centered in the passband. The software provides a tuning indicator (Figure 2) which allows you to accurately adjust the CW signal. The software also decodes the CW signal and this provides some basic housekeeping information.

The BPSK-11 implementation on ARISsat-1 incorporates strong forward error correction (FEC). This has proved to be extremely robust and deep fades with short periods of total signal loss due to spacecraft spin and polarisation changes generally result in no loss of data.

Experimentation

If you are interested in experimentation then ARISsat-1 is the ideal satellite. The BPSK-100 mode with strong FEC is a new way of collecting amateur satellite data. This means that there are many unknowns as to how such a mode will perform in practice. For example how well does the FEC work under varying amounts of fading, what is the effect on the decoder of mistuning the telemetry signal? What happens if the decoder loses lock, how quickly does it recover and how much data is lost? What is the effect of receiver audio bandwidth on decoding efficiency? I have been experimenting with all of the above and there are still other questions to be answered.

Summary

Whether your interests are digital modes, SSTV, satellite communications or in fact any aspect of practical communications then ARISsat-1 is well worth a look. To find out when ARISsat-1 will be over your location you can go to the AMSAT website and select "Passes". Enter your location and you will see a list of available passes. Alternatively you can contact me and I will be happy to tell you the best times to listen. ARISsat-1 is the ideal satellite to see how your 2m station performs with a very interesting satellite. βi

WANTED: copy for *Break-In*

My stock of articles etc for future issues is running low so I appeal to members to assist with material for publication. This could be short or long articles on any topic related to amateur radio and electronics, constructional articles, book reviews, equipment reviews, software reviews, branch activity reports, etc.

I should also like to receive articles on electronics related topics such as auto-electronics, home sound systems, workshop practice; in fact anything that hams might find of interest. Thanks and 73,

John R L Walker ZL3IB (Editor), Email <zl2tw@nzart.org.nz>

NZART RadioScience Education Trust KiwiSat Research Grant

As announced in the July/August 2011 issue of Break-In, *the NZART RadioScience Education Trust received an application for a research Grant from Massey University College of Sciences. In a supporting letter from AMSAT-ZL: a vital part of KiwiSat lies in the success in the Attitude Determination and Control (ADAC) scientific experiment and it is essential that this section of the project receives the best possible assistance. It is the opinion of AMSAT-ZL that Dr Potgieter, through Massey University and his student helpers, offers the best and possibly only option if the project is to remain in New Zealand.*

The Trustees are pleased to announce the application for the Grant was successful and the presentation of the award took place on Tuesday 16 August at the Albany Campus of Massey University. One of the Trustees traveled to Auckland to take part in the presentation of the award and learn firsthand the fine detail of the research being undertaken.

Dr Johan Potgieter, the cluster leader has Masters Degree student: Kirill Makarov, plus four, fourth year degree students: Andrew Webb, Thomas Poupouare, Travers Biddle and Utsav Patel. Each student will have specific research aims but all working towards a common goal detailed below.

A one year study grant for Kirill Marakov. He will be developing the ADAC system from concept, through to mathematical modeling and then producing the necessary software code to enable, initially, ground control of KiwiSat. He will also develop the automatic stabilization and pointing of the space frame using the sun and horizon sensors and the on board magnetorque coils.

Andrew, Thomas, Travers, and Utsav have each been awarded a study grant for a period of one year. Their task will include current design evaluation, development of spacecraft system testing equipment, the calibration and the integration of the magnetometer the sun and horizon sensors, and the spacecraft camera into the space frame. These projects are to be undertaken in conjunction with the ADAC mathematical and modeling by Kirill Marakov.

The study grant is for $1500 for each of the five students; a total of $7500. This sum will be deemed to include the cost of all material requirements for their individual project objectives including the production of all required specialised test and trial/calibration equipment.

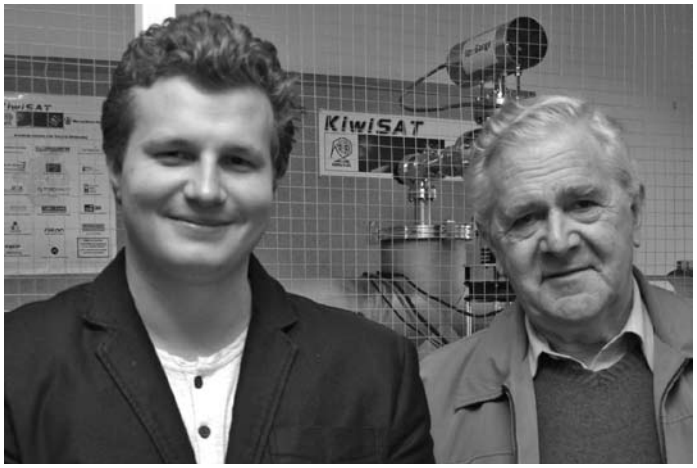
The Grant was presented by Peter Norden ZL2SJ, a Trustee of the NZART RadioScience Education Trust, to Professor Ian Maddox Regional Director and Associate Head, School of Engineering and Advanced Technology, who thanked the Trust for the financial contribution for this research.

KiwiSat project manager Fred Kennedy says the research is vital to ensuring the satellite can fulfill its dual experimental purpose in space, to test technology for accurate positioning of a small satellite which could open up possibilities for similar low cost, low risk satellites in environmental monitoring, and to expand communications for amateur radio operators for diverse uses.

At the end of the presentation Fred Kennedy ZL1BYP conducted a tour of the AMSAT-ZL Clean Room facilities and Thermal Vacuum Chamber. Many photos were taken to record this important day for the Students, the AMSAT-ZL Team of Volunteers and the Trust. The grant is the largest the Trust has presented and the first that can be honestly labeled RadioScience. At the conclusion of the visit, Peter Norden wished the recipients of the grant the very best, and hoped that they would be successful in their scientific endeavors.

Other persons at the presentation were Ian Ashley ZL1AOX Treasurer/Secretary AMSAT-ZL, Dr John Henderson KiwiSat ADAC development advisor/representative. βi

Professor Ian Maddox receives the cheque from Trustee Peter Norden.



Massey University Masters in Engineering student Kirill Makarov with Peter Norden.

Massey University KiwiSAT researchers with members of NZART.

Telecommunications in the Electricity Industry; *a short history of the Auckland area*

by Jim Paltridge ZL1JW

Starting in about 1930 with the construction of Arapuni Power Station was the need to communicate with the sub-stations at Hamilton, Bombay and Penrose. A single telephone line on poles was constructed over a similar route as the 110 kV power line between these stations operating manual telephones at each station with insulating transformers protecting the users from induced voltages, lightning and even accidental touching of distribution power lines. Intermediate test huts were erected about every ten miles on the route for test and fault isolation purposes.

This line remained in service to the 1980s when it was superseded by microwave radio systems. In the early 50s a 3-channel carrier system ran over it from Hamilton to Penrose; this terminal was later moved to Otahuhu. The 3-channel system was later modified to carry speech and low speed data from various stations to the North Island System Control at Whakamaru to provide status of line circuit breakers and loading on power lines. In the 1950s additional single channel carrier systems were also carried over it from Meremere to Hamilton and Otahuhu North of Penrose power lines were built across the Auckland isthmus to Henderson and onwards to Kaitaia via various intermediate substations. The lines north of Henderson initially operated at 50kV and had telephone lines erected below on the same poles for communication.

During the 50s and 60s ZC1 radios modified for crystal control on 2.5 MHz were used in the construction of the 110 kV power lines during hauling and tensioning of the conductors. AM M/HF radios were installed at substations to communicate with each other in the event of telephone failures and to communicate with field parties. They operated on 2.7, 3.3 and 5.1 MHz with dipole antennas. Sub-stations are very noisy radio locations but went well when the power was off during major system faults.

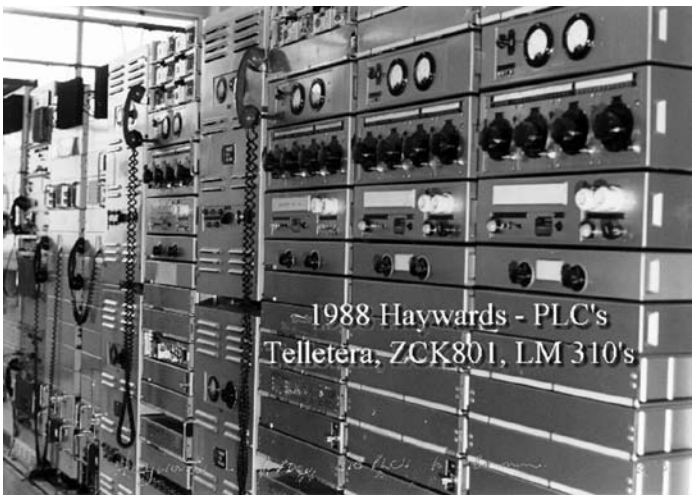
In the Auckland area multi pair pilot cables were laid between Otahuhu, Mangere, Penrose, Mt Roskill, Hepburn Road and Henderson substations and these carried telephone, telemetry, telesignalling, remote control and protection signaling between the stations. These were subject to numerous faults due to construction damage, even fires and were phased out during the late 70s in favour of radio systems

Next generation of communications.

As the power grid grew, especially when the 220 kV lines were built from the Waikato stations to Otahuhu and onwards more communications were required to provide more reliable service and at this stage Power Line Carriers (PLC's) were installed on these lines by inserting LF frequencies in the range 40 to 200 kHz in 4 kHz steps on the lines. These also enabled the line protection relays to send signals between each end of the power line to identify line faults and enable them to clear before other lines tripped. These PLCs also carried speech, data and telemetry between stations and the control station at Whakamaru.

In the urban areas point-to-point UHF 1, 2 or 24 channel radio systems were established between the intermediate substations to provide speech, data and protection signalling circuits. These were subsequently replaced with Digital Microwave Radio multi channel systems with linking stations in the Waitakere ranges and Bombay which were later also used for the North Island Digital Radio system.

Also MHF radio was replaced by VHF radio via repeaters covering most of the areas where power lines were erected to provide emergency communication with other stations and mobiles for patrol and repair of grid line faults. These have since been replaced again with UHF trunk dispatch (selective calling) radios provided by a specialist supplier. Fortunately the establishment of the original AM VHF repeater sites enabled these to be used for the expanded microwave radio systems as many of the power lines were in remote areas where commercial radio service was not available.



PLCs installed at the Haywards substation in the 1980's. These were ZCK310 all valve types and earlier Telettra types solid state and later Ericsson ZCK801 solid state types.

Automatic telephones finally arrive

In the late 1980s it was obvious that the existing telephone system could not cope with the increase demand put on it and a decision was made to install 22 Sopho digital exchanges in the North Island; tied together as a closed number network and initially using the carrier systems as trunks and other analogue microwave radios that had been installed during the 70s and 80s. At the minor stations remote extensions were installed to the main exchanges.

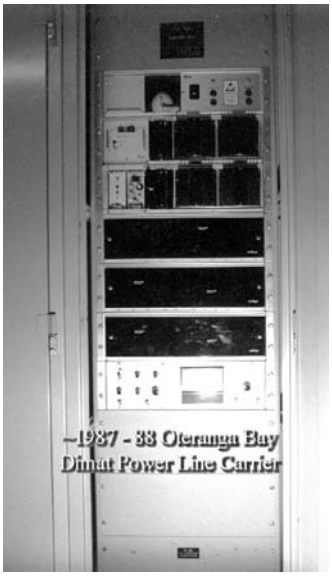
Subsequently digital trunk circuits were added to the exchanges using the Digital Microwave Radio system as it became available. This meant that fewer exchanges were required in the North Island; 11 of these exchanges were relocated to replace the Siemens VDZ "step" type systems installed ten years before in the South Island.

This system, which is still in use today, has been very successful and gives automatic calling between all sub-stations, power stations and the three control stations at Otahuhu, Haywards and Islington as well as the grid security stations at Hamilton and Wellington.

A new VOIP (Voice over IP) system is now being planned to replace this system that is now coming to the end of its useful life.

Digital communications NZ wide

During the 1990s it was recognised that the capacity of the analogue systems was limited and that a more robust network was required. This saw the introduction of a dual digital microwave radio system erected between Kaikohe and Wellington with major terminals between both



DIMAT type modern PLCs solid state all ICs and synthesised frequency generation; now also largely gone.

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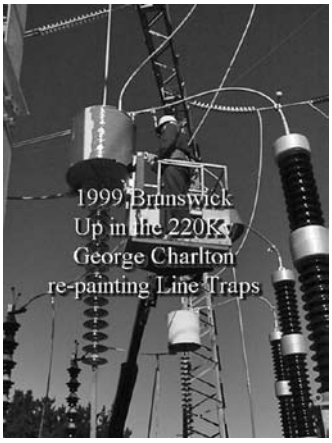

Line traps with coupling capacitors which coupled the LF signals into the power lines and the traps which stopped the signals going into the yard but onwards to the next station. These were parallel tuned circuits and carried all of the line current up to 2000 amps.

systems at Otahuhu, Hamilton, Palmerston North and Haywards. Microwave radio was also installed in other parts of the South Island and continues to provide communications for these areas.

At this stage the technology and capacity of PLC systems had come to the end of its useful life (there was once over 200 of these from Kaitaia to Invercargill) it was decided to phase out most of these systems due to age and limited capacity. By year 2010 very few will remain in service, at the present time only two systems exist north of Hamilton.

Increased capacity in New Zealand

It was recently obvious that systems carrying up to 34 M/bits which equates to 480 phone circuits was not sufficient to carry any increase in traffic with the use of high speed data circuits that often take the capacity of 30 telephone circuits (2M bits/s) or more.

Now being installed are dual fibre optic cable systems between all the major sub-stations in the North Island to link all stations into the network using the latest SDH (synchronous digital hierarchy) systems, which will have more than 100 times the capacity of the existing system. These will use a combination of leased fibres in the ground and fibre optic earth wires on the power pylons. These will be arranged as ring circuits with automatic diversion of the traffic to the standby route in the event of a fault.

What has changed to require the increase in capacity?

Firstly none of the sub-stations are now manned and all are remotely controlled from regional control stations at Otahuhu, Haywards and Christchurch. All alarms and events are sent to these centres by SCADA (supervisory control and data acquisition) systems which control all circuit breaker functions on grid lines, transformers and supply feeders to the lines companies.

Also as mentioned earlier protection signaling on power lines is of extreme importance, all of the 220 kV lines and most of the 110 kV lines have duplicated systems in operation on diverse routes between each end. These mostly use digital systems to provide accurate protection of the grid lines. This enables faults on the grid to be cleared in the quickest possible time without interruption to other lines and enable auto re-close where required. As the electrical grid has grown, so to has the requirement for an enlarged and more diverse communication network.

Also inter office communication between regional offices in Auckland, Palmerston North, Christchurch and Wellington for speech, internet systems, video conferencing and data transfer will enable full use to be made of the enlarged system now and well into the future.

Historically the electricity department and then Transpower® have taken a conservative approach to communications and not introduced new technologies until they have been well proven.

Personal

I started as a basic grade technician with the NZED in 1970 and retired as supervisor at Transpower Communications in the Auckland area. Employed by Transfield Services in December 2010, I specialised in radio and subsequently worked in all fields of the above. My final qualifications were NCEA level 4 Telecommunications (Radio Strand). My original supervisor was Des Ryan ZL1RR who had worked in the area since the early 50s. He was also the tutor for Amateur Radio at Otahuhu College night classes. He has a vast knowledge of communications and taught us by example and his experience.

Telecommunications in the Electricity Industry has come a long way in those years and is a tribute to the hundreds of technicians from Whangarei to Invercargill who built it and kept it going reliably as they do today.

My thanks to John Wilson ZL2TAU for reviewing this article.

(All photos by D. Hodge)

Monitoring Service

Monitoring Service Co-ordinator: John Martin ZL1GWE
<john.martin@nz1.ibm.com>

Greetings to all, including Short Wave Listeners and contributors. According to the IARU Monitoring Service Region 1 August report, the HF bands have been inundated with Over the Horizon Radar (OTHR) systems, these include:

- Chinese OTHR which often is heard below 7 MHz and often up to 7020 kHz – this is a stereo type radar system, which sounds like a tractor and is very distinctive.
- North Korean HF Radar, which apparently is a Coastal Radar (CODAR) transmitting on 10140-10170 kHz daily and all day. Hopefully the digital mode users will have some relief, as an official complaint has been put in via the German PTT.
- Australia JORN (Jindalese Operational Radar Network on 21 MHz with a 50 Pulses per Second rate, it also has a distinctive short introductory tone, just before it commences transmitting. Often this system has been accused of being SuperDARN or Tiger transmissions, which at long last have been proven to be incorrect (we are assured by the station manager, that our own Tiger is closely monitored for errors).
- Often the Cypriot based OTHR has a 50 Pulse per Second rate, but their transmissions are normally constant emanating from the direction of Europe, by short path or long path propagation.

Reference[1] IARU Region 1 Report August 2011.

One of the most important techniques used by both the monitoring service and by Amateur Radio or SWL's alike is the ability to measure frequencies. There are many techniques around these days, which include the use of frequency counters or equipment with digital frequency readouts. However, are they accurate? Some of the techniques suggested by IARUMS Region 1 can be found here: [2] Measuring Radio Frequencies, where Method 3 appears to be the most accurate. Under ITU-R SM 377, for the HF bands the accuracy only needs to be down to 1 Hz. However, this can be enhanced with a crystal controlled frequency synthesiser (a known stable source), which is set to a frequency for instance to a frequency of 1000 Hz, below or above the received or unknown frequency. Normally a balancing network is used, to ensure that both signals are equal in amplitude, therefore a slight change in receiver tuning or the frequency of the receiver oscillator less than or equal to the intermediate frequency (IF) bandwidth does not affect the difference frequency. The two frequencies can be applied to the X and Y amplifiers of an oscilloscope. If the difference frequency is not exactly equal to the 1000 Hz frequency, a rotating ellipse (Lissajous figure) is displayed on the screen of the oscilloscope. The

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World War 2 RADAR set; Cabin and Equipment

by Bruce McMillan ZL4BAM

On 20 June 1944 a British RADAR set type CD (Coastal Defence) No.1, Mk V was declared operational by the NZ Army, it replaced the second RADAR set that had been installed at Rerewahine (near Taiaroa Head) on the Otago Peninsula. The CD No. 1, MkV was a centimetric set built in the UK, it had a range of 43 000 yards (± 25) and a bearing error of ± 5 minutes of arc. It was used for Coast Watching, Gun Fire Control and Early Warning.

Interior of WW2 Radar Hut FTDP-542415-a.

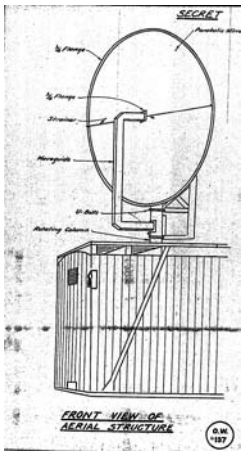
The cabin that once contained the RADAR set was later purchased by Tom Rowlands ZL3JX, a Canterbury farmer. Tom used it for years as his Radio shack. Following Tom's death, I, with the help of Stan ZL4TQG, tracked the cabin down. In time it was returned to Dunedin where it was placed in storage for several years. The search for the cabin was carried out on behalf of the Otago Peninsula Trust's Fort Taiaroa Sub-committee. Recently the cabin was moved to the Otago Peninsula Museum at Portobello where it is to be put on permanent display.

It is planned to replicate the equipment that once occupied the cabin and to that end I am asking for assistance from anyone who may be able to provide information and/or parts that will help us to recreate what the interior of the cabin was like back in 1944. Obviously it is not intended to fully replicate the equipment, only to build suitable cabinets complete with control knobs, displays, etc. Fortunately we have the cabin's 2 metre dish.

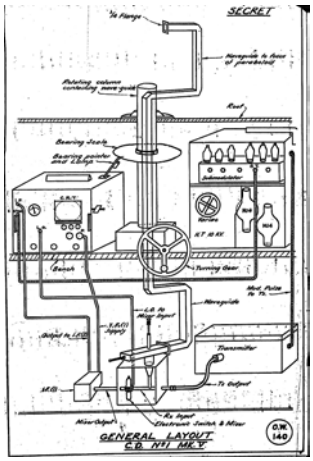
The Otago Peninsula Trust is fortunate to be in possession of some circuit information and pictures of CD No. 1, Mk V, sets from the late WG (Gib) Pinfold's Collection. Gib was in the NZ Army and worked on maintaining various RADAR sets during WWII.

The pictures included with this article show something of the RADAR Cabins exterior and interior of the cabin.

Contact Bruce McMillan, ZL4BAM, 03 445 4124, <brucemcm@slingshot.co.nz> or Laurie Stewart 03 4777268, <ltstewart@ihug.co.nz>



Front view of antenna structure.



General view of radar hut.

speed of rotation of this ellipse is proportional to the frequency difference. Another method that could be deployed given the use of high speed computers and audio cards is Fast Fourier Analysis (FFT), operating in real time. The incoming signal is digitised, saved and then the frequency spectrum can be calculated and displayed. Some of the benefits of using these methods include: very high frequency resolution and accuracy; reproduction can be easily achieved and the ability to digitally store the resultant data.

There are many other methods, and I am sure many people have their favourite method they deploy? How about sharing them, then we can compile them into a collection and put them on the NZART website?

The inaugural winner of the first NZART Top Intruder System Observer Award for 2011 will be announced soon, so until next time, keep those reports coming.

Report intruders to: <MS@NZART.org.nz> or <MS2@NZART.org.nz> or <IntruderWatch@GoogleGroups.com>

John (ZL1GWE)

Intruder System Observer League Table 2011 (up to end of August 2011)

Contributor Name/Call-sign	Number of reports received	Number of verified reports
John ZL1GWE	315	357
Bob ZL1BAD	153	200
Gary ZL2iFB	34	41
ZL2TZE	4	11
Dallas NZRDXL	10	10
ZL2CC	2	2
ZL1TPH	2	2
ZL1CC	1	1
ZL1AAO	1	1
ZL2SKY	1	1
ZL3NB	1	1
Luke VK3HJ	1	1
Others	0	0

References

[1] <http://webcache.googleusercontent.com search?q=cache:http%3A%2F%2Fwww.iarums-r1.org%2Fiarums%2Fnews2011%2Fnews1108.pdf>

[2] <http://www.iaru-r1.org/index.php?option=com_content&view=article&id=276&Itemid=192>

Digital Modes

Murray Greenman ZL1BPU
<zl1bpu@nzart.org.nz>

I promised in the last article to discuss what can be done with GPS 1pps pulses, and in this column I'll also describe some interesting new developments regarding synthesizers and inexpensive embedded controllers.

Junk Sales

Don't you love 'em? I get great enjoyment out of going to junk sales. Perhaps we should call them 'Rallies' in the English tradition, or at least 'Swap Meets' in the US tradition.

The best way to enjoy the Junk Sale is by taking a table and filling it with stuff. Then everyone comes to visit you, and you get to sit down and rest, if you remembered to take a chair! Another advantage of being a vendor is that you get a sneak preview of the other goodies on offer.

My vendor friends; have you noticed how the tables get smaller each year?

At the Hamilton Market Day I found an interesting beast; a Plessey PR152 6-band receiver. Very old (1960s?) and I don't expect the performance to be anything special, being a single conversion superhet with 1.6MHz IF and Germanium transistors. The most interesting feature of this receiver is its film strip dial and mechanical tuning arrangement. There is a strong Aluminium casting supporting the tuning mechanism. The user dials the frequency on thumbwheels beside the drum of the dial, operating an epicyclic mechanism and a worm drive to anti-backlash gears on the tuning capacitor.

Apart from the minor issue that it doesn't go, the receiver is in excellent condition. I would love to hear about the receiver's history from the original owner (who may have been ZL2TQZ), or from anyone with a schematic or other information about the receiver, which I intend to restore.

What to do with 1 pps

Little GPS 'engines' (small GPS receiver circuit boards) have been popular with hobbyists for some time. Typically, these units connected to an active GPS antenna, are powered from 5V or 12V, and put out serial telemetry in the NMEA 0183 format. You can use proprietary software for mapping or other purposes, or write your own software. Since I have to stop driving and change glasses to read a map, I still use a GPS module and computer-based mapping program while away on trips, rather than one of those new-fangled dash-mounted GPS toys. I use *Memory-Map* software[1], which has full topographical and street maps for the whole of New Zealand, and a 3D view option. I use it on my little Asus netbook, with a modern Atheros 1520 GPS receiver unit, which is USB connected and powered.

Well, if you were lucky, your old GPS engine might have had a '1pps' output. The ones you get today (easy to find on internet trading sites) usually have 1pps options, and if you want to explore the techniques I am about to describe, make sure you have one with '1pps'. You can't do what I will suggest with an in-car consumer type unit.

'1pps' of course means 'One Pulse per Second'. The important point is that once you have a GPS fix (and not until), this 1pps pulse from the unit is very precise and can be traced to world standards for time and frequency. Generally the rising edge of the pulse can be set through calibration to be within a few picoseconds (ps, millionths of a second) of standard time.

Two of the applications I will describe use 1pps as a timing source, but first here's a way to use 1pps as a highly reliable high resolution frequency reference.

Let's say for example that you have a 10MHz reference oscillator (such as an OCXO or TCXO), which you wish to calibrate. Connect the oscillator output to an oscilloscope, set it to display one full sine wave across the screen (time base set to 10ns/div). Then connect the 1pps to your external trigger input (or the other vertical input if you don't have an external trigger input), and arrange the scope to trigger off the leading edge (use normal trigger rather than auto).

Observe the trace; it will flash once per second, and show a sine wave which will drift slowly one way or the other. If (using the 10MHz example) the trace drifts one division (1/10 cycle) in a second, you have an error of 10ppb (1 part in 10^8). If the trace moves to the left, the frequency is high, if to the right, it's low. Provided you know the oscillator is accurate to within 1Hz, this technique works at any frequency that is an exact multiple of 1Hz. If you don't know the frequency that accurately, you need to divide it down first.

You could also build a GPS disciplined oscillator (GPSDO)[2] of your own. In these devices, the time difference between the rising edge of the oscillator signal and 1pps is measured with a resolution of a few ns, and the resulting value used to calculate the error. The error value is turned into a DC voltage, which is then used toadjust the frequency of the oscillator by a tiny amount. Design and evaluation of GPSDOs is a hobby in itself. The one I designed recently achieves accuracy and stability approaching 1 in 10^{12}.

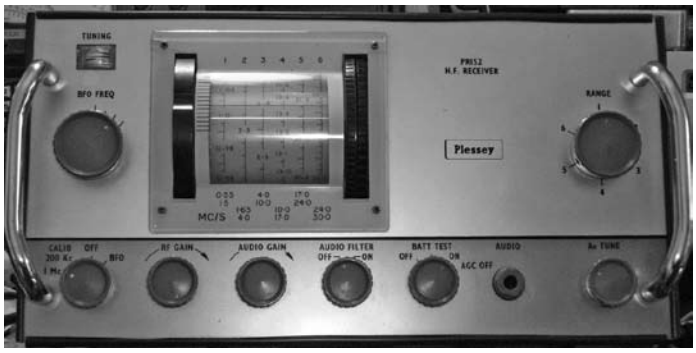


Figure 1. The Plessey PR152 receiver.

Figure 2. The ZL1BPU Simple GPS Disciplined Reference.

Software 1pps

There are two very interesting Amateur applications which use 1pps timing. The first of these simply ensures that the software is exactly in time synchronism with the received signals, while the other actually locks the receiver to GPS using DSP and phase-locked loop techniques.

In both the techniques to be described, the 1pps pulse from the GPS receiver is fed into one channel of computer sound card, and the receiver audio is fed into the other channel. The hook-up is therefore very simple.

Chirp sounding

The most popular way to achieve ionospheric sounding (in order to measure the ionosphere and determine propagation) in recent years has been to use 'Chirp Sounding'. In this technique, a CW transmitter is swept at a constant rate throughout the HF spectrum, and a receiver is swept to track it. A popular rate is 100 kHz/second. The receiver bandwidth can be quite narrow, and thus the sensitivity is high and little transmitter power is required.

The returned signals from the ionosphere will beat with the transmitter signal, since they are delayed,

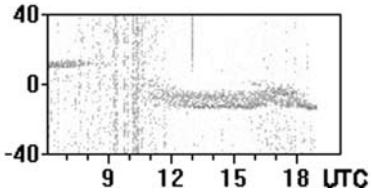


Figure 3. A typical single-frequency sounding.

and by the time they arrived, the transmitter has moved on. For example a reflection from a layer 300 km above will return in 2ms, by which time the transmitter will have moved 200 Hz. The receiver response can be plotted using an FFT display, where the various audio frequencies represent reflection height, and brightness the strength of the response.

Where does GPS come in? Well, if you are interested in the propagation path from one site to another, you need the transmitter to be at one site, and the receiver at another. A typical military or diplomatic radio network does this; the transmitter is at headquarters, and the receivers at each of the outposts. In a military setup this also means the outposts can maintain radio silence. So, somehow the receivers need to know when the transmitter starts, in order to exactly track the sweep. Remember that a timing error of 1ms would result in a height measurement error of 150 km! What happens is that the transmitter locks its start of transmission to a specific 1 pps pulse, say 5 and 35 minutes past the hour. Then the GPS equipped receiver starts the sweep at the same time. By using a combination of the NMEA time data and 1pps the unique identity of each 1pps pulse is known.

This technique is known as oblique sounding, and the beauty of it is that you can also do it at home, at no cost, without operating a transmitter![3] The simplest passive sounding technique is the single frequency approach, where a fixed frequency HF receiver listens for the chirps passing by within the receiver bandwidth. Special software can detect these chirps, and knowing time from a GPS receiver, can plot these responses with high time resolution, and so making a graph of the path delay (time of flight) between the transmitter and receiver, which of course includes ionospheric information. Because of the technique used, multiple ionospheric layers can be detected. Because the receiver is on a single frequency, you can only analyse that frequency, but at least you can study the paths from all sounders that sweep by.

In Figure 3 we have arrival time (ms) on the vertical axis, and time of day (GMT) on the horizontal axis. At the left we see long path propagation from the sounder in Cyprus, and on the right the short path, with both F1 and F2 layers visible. This was recorded in New Zealand on 25MHz.

The nicest software for this application is without doubt ChirpView, by Andy Senior G0TJZ[4]. The program is reasonably easy to set up and operate, much better than the early days, when all sorts of hardware was required. Peter Martinez G3PLX was the pioneer of the passive Chirp Sounding technique. Back then nothing was known about where these sounders were, or what schedules they used. Peter and I achieved the first two-station observations of these sounders back in about 1997. We had a lot of fun working out how to maintain the same time in order to observe the same sounders while 15 000km and 12 hours apart!

The New Zealand armed forces operate chirp sounders. These do not however operate continuously. There are also some from Australia, and plenty from around the world that can be received when conditions are right. There have been many examples of chirps received right around the world, even twice around the world. There are other sounders operating at different sweep rates, and sounders with complex transmission schedule, but there are enough conventional 100 kHz/sec chirpers with 15 or 30 minute schedules to make receiving interesting.

Clicklock

Running a Chirp Sounding experiment might sound a bit like watching grass grow, but that's nothing compared with the Clicklock technique! The purpose of this technique (also developed by Peter G3PLX) is to lock the transmitter and receiver to a common GPS 1pps reference. This is done in order to allow reception using extremely narrow (sub Hz) bandwidth techniques.

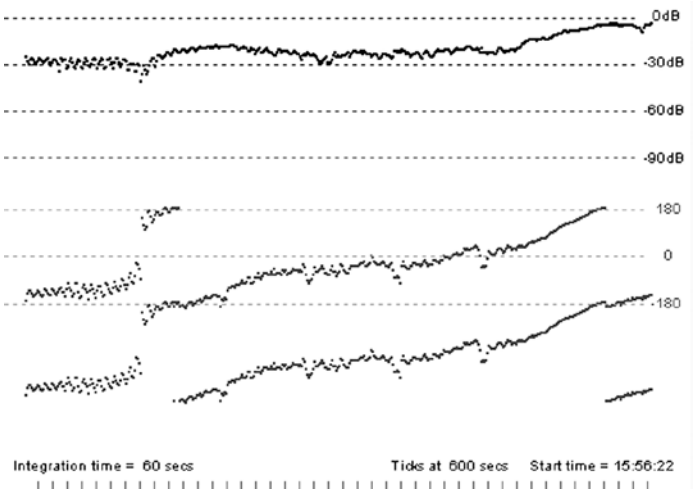


Figure 4. A Clicklock plot of WWVB on 60kHz.

Unaided, the stability of even the best receiver is not good enough for such narrow bandwidths. Clicklock does not lock the receiver directly, but uses a software oscillator in the receiving software to track the drift in the receiver down-conversion and BFO oscillators, as well as the PC sound card sampling rate drift. As these oscillators slowly drift, the software oscillator is adjusted to track the signal.

The reason why such extreme tracking techniques are necessary is that Clicklock uses carrier synchronous coherent integration, to track signals that are completely buried in the noise. This technique is only useful at LF and MF, because only here is the carrier phase of the received signal stable enough. As each cycle of the signal is received, it is added to (integrated with) previous samples, using I&Q techniques. Over time, the enhanced phase and amplitude of the signal can be recovered, while the noise accompanying the signal is averaged out.

Unlike additive techniques such as image enhancement and noise reduction filtering, which work with asynchronous detected signals, and can achieve only modest improvement, coherent averaging has no theoretical limit to the achievable level of enhancement. The trade off is in bandwidth and signal recovery time. Because bandwidths are so narrow, the technique is really limited to detection of carriers (which of course also need to be stable).

Con ZL2AFP and I have demonstrated this technique with great success on 181.4 kHz[5]. I transmitted a GPS locked signal (simple, I reset the carrier phase every second using 1 pps), and he received it using Clicklock. He was able to detect my 100 mW transmitted signal (EIRP about 4µW) at 500 km range, and was also able to reliably identify it when I changed the transmitted phase angle by 90° for 10 minutes, then restored it. I have also received WWVB on 60 kHz with this technique (easy), and stations from Europe on 75 kHz and 212 kHz.

In Figure 4 you can see the signal strength (blue trace) at the top, increasing slowly, and the phase (red plot) slowly rotating. The recording is over about six hours, with an integration time of 60 seconds. You can quite clearly see the hourly changes in phase, which WWV uses to indentify itself. At an integration time of 60 seconds, the receiver bandwidth is effectively about 0.01Hz, so the receiver needs to have (and easily has) this order of stability.

There are two sound card programs for Clicklock use. Phasescope by Scott VE7TIL[6] plots only the amplitude and phase, but gives a good indication of signal detection. ZL2AFP's Clicklock[7] plots phase and amplitude on a 'vectorscope', and also plots phase and amplitude over time, so allowing you to see phase or amplitude keying and the effects of propagation. The time plot requires I&Q integrators (providing phase and amplitude) to 'leak' at a fixed rate related to the integration time, otherwise they would eventually overflow. This idea was my small contribution to the technique.

In Figure 5, at the top left you see an oscilloscope display of the RF and audio clicks, used to set synchronism.

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The Morseman

Gary Bold ZL1AN
<Morseman@nzart.org.nz>

Those were the days

My Yaesu FT767-GX has become prone to bouts of sulkiness. At random intervals the audio suddenly drops away, and it won't transmit. A sharp disciplinary blow to the case, or in stubborn cases dropping the front a few centimetres onto the bench brings it back to life. But this is not good. In my experience, such intermittency is caused by a dirty connector somewhere.

Three times I have had the case off on the workbench, but of course under these conditions it never malfunctions. A multiplicity of tiny connectors is used to connect everything to everything else. I have wiggled and re-seated all I can see, and squirted them with magic contact-cleaning juice. This fixes it for a day or two, but then the intermittent fault comes back. The notch filter went away after my last squirting session, so I'm losing ground. I ponder my next move.

I also have an Elecraft K2 and a Kenwood TS-50s, but I like the Yaesu for its excellent SSB quality, when I want to verbalise with somebody. In the interim, I am using the TS-50s for SSB, which has better speech quality than the K2.

While lubricating and wiggling, my mind fled back to the simple days of yore. In the 1960's, although we often used commercial receivers, almost all of us used home-brew transmitters, and such intermittent faults, in my recall, were almost unknown. Everything was soldered, and there was hardly anything to go wrong anyway.

In 1964, I and my mate Brian were graduate students, and in a couple of hours one night we soldered together an all-band CW transmitter. I had saved up to purchase a Geloso® 102 VFO, which were very popular in VK and ZL at the time. A rather poor scan of the circuit is shown in figure 1. John Geloso was an entrepreneurial Italian radio engineer, who produced thousands of these units in the 1950's. The instruction manual was also in Italian, but that was no problem, because it was obvious how everything worked. And it covered all HF bands!

The oscillator was a series-tuned Colpitts, and the other two tubes were cleverly used as buffers, doublers or triplers, depending on the band used. A single three-wafer switch selected the band, and output current was adjusted using the 35 kΩ potentiometer which varied the screen-grid voltage of the 6L6 output tube.

Figure 2 shows the 807 beam-tetrode class-C amplifier we wired up to follow it. The resistor/inductor combinations associated with the grid and plate are "grid-stoppers" and "plate-stoppers", lossy impedances formed by winding wire directly around the resistors. These were supposed to inhibit instability, and apparently did. The full tube current passed through the key, and the upper terminal rose, on key-up, to a high-ish voltage, but this was not considered a problem in those easy-going days, and anyway, the arm of the key was grounded. An RF choke was typically connected in series with the key, with some capacitance, adjusted to suit the operator's taste in key-clicks, across the contacts.

◂ *continued from page 18*

To the right of the oscilloscope is the Vectorscope display. It shows a slowly growing black line from the centre. If the signal is off frequency or the phase changes, the angle of the line changes, and may even go round in loops. At the top right are all the controls and performance displays. The lower half of the display is the main amplitude and phase plot over time.

The Clicklock technique relies on analysing harmonics of the GPS 1pps pulse received at the antenna along with the signal to be detected. The software determines the phase relationship of these harmonics, which it uses to steer the software oscillator used to demodulate the signals in a software quadrature detector. The receiver must be stable to within a few Hz over the duration of the reception.

There is also an (expensive) and sophisticated commercial application named *Softpal*[8], based on similar coherent averaging technology. *Softpal* can also track and demodulate MSK transmissions. What is more, it was even developed in New Zealand.

Coherent averaging is not practical above about 600 kHz, because it can be difficult to detect the GPS pulse harmonics reliably, can be difficult to achieve sufficient receiver stability, and of course the phase shift due to the ionosphere becomes too large for the longer integration times. It certainly works on 600 m, and extremely well on the 2200 m band, as we've shown. I have published a simple transmitter design which can achieve the necessary stability and can be GPS locked. It can identify itself by computer controlled accurate phase shifts[9].

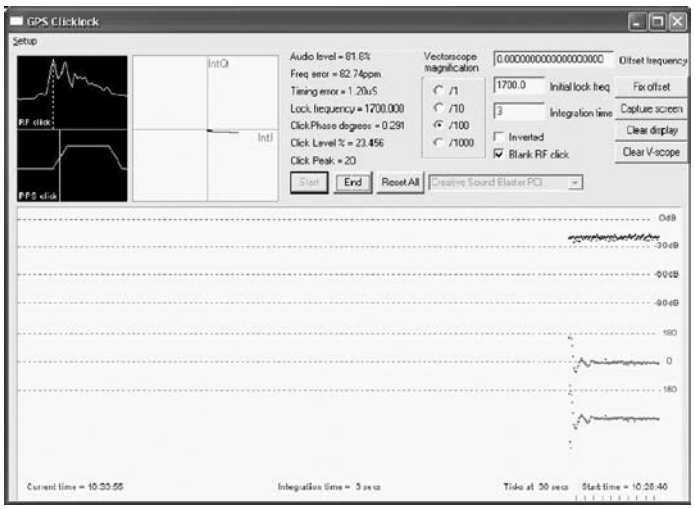

Figure 5. A screenshot of Clicklock in action.

Embedded controllers

There are many reasonably inexpensive kits, which can be used to control equipment for radio applications. However, for absolute value for money and flexibility of application, you can't do much better than a recycled ADSL modem. The simpler single-port ones without WIFI are frequently available for next to nothing from op shops and web trading sites. The one I have is the D-Link DSL-502T. It has a network connection, a serial port, at least a dozen digital outputs and four LEDs on the front panel. The best bit is that you can re-flash the unit with OpenWRT[10], which is a Linux style operating system!

Thanks to the expertise of Andrew ZL1WJQ, I have my unit operating as a MEPT controller on 508 kHz. It simply reads a list of frequencies, and sends a new one every second to my DDS synthesiser.

Final finals

I have just built a small fractional N synthesizer designed by Tom DG8SAQ[11]. It uses a USB interface, and is designed as a VFO for Softrock® receivers. He and I are testing an application to use it for MEPT. Andrew ZL1WJQ is developing a control system for the N3ZI DDS-2 synthesizer[12], and is writing embedded controller code for several synthesisers. I plan to review these and other inexpensive synthesizers in the next column.

References

[1] <memory-map.com.au/>
[2] <www.qsl.net/zl1bpu/MICRO/SIMPLE/SimpleGPS.htm>
[3] <jcoppens.com/radio/prop/g3plx/principle.en.php>
[4] <www.dcs.lancs.ac.uk/~senior/chirpview/index.html>
[5] <iaru-r3.net/13r3c/docs/029.doc>
[6] I can no longer find this software
[7] <www.qsl.net/zl1bpu/SOFT/click.htm>
[8] <www.lfsoftpal.com/>
[9] <www.qsl.net/zl1bpu/MICRO/EXCITER/Index.htm>
[10] <openwrt.org>
[11] <sdr-kits.net/QRP2000_Description.html>
[12] <www.pongrance.com/super-dds.html>

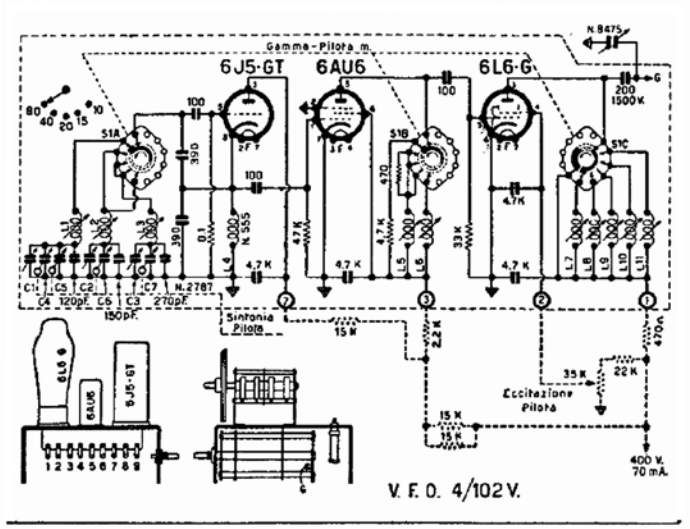

Figure 1. The Geloso VFO.

We found that not all 807s were equal. Tens of thousands had been made by different manufacturers for US WW2 use, then released afterwards onto the surplus market. But only the *RCA* ones could be relied upon to completely obey the published specifications.

Class-C shunt biasing required only a coupling capacitor, through which the grid-cathode diode conducted to pull the grid negative, and a resistor from grid to ground to leak charge away. From memory, we adjusted the output of the VFO to produce about 2–3 mA indicated on the grid meter, and the output pi-coupler components to produce about 50 mA of plate current.

For some years I worked all over the world using this simple setup, and it never once failed me. I only discarded it when financial security induced me to buy and construct a Heathkit HW101. I still have it, gathering dust in the basement, and one day for old-times sake I'll fire it up again.

More Morse in movies

Bob VE7BS writes:

"There is another movie where the Morse was incorrect. I recall it being the classic WW2 RAF film *'Target for Tonight'*, but I have just viewed the DVD of this, and it's not there. The movie was shown in our war-time camp cinema, and the wireless operator in "F for Freddy", returning from an operation, is heard sending a message indicating that the aircraft is in trouble. But the audio Morse sent is '*GFA1/2/3 GFN3*', the Air Ministry idling call-sign sent every day before sending the keys for decoding cipher messages!

"This sequence was familiar to just about every RAF wireless operator present! All those in the audience joined in with a chant of "dahdahdit dididahdit dahdit dididididahdah". The word got around. On subsequent nights the choir was ready for the whole sequence. Some went to the show just for the fun of doing it!"

You can download this movie, in 5 parts, from You Tube®. I did, and as Bob says, nowhere is any audio Morse sent. Bob is following up other leads. Does any other Old-timer recall what movie this was in? It would be interesting to hear it.

Several have pointed out that the opening music of the original *Inspector Morse* TV series, plays "Morse" at low volume in the background, then fades out. The Morse is reasonable, and readable with concentration.

Paul ZL1AJY, sent me an audio grab of the opening music of *"Downton Abbey"* recently shown on TV. In the background, faint Morse is heard, some of which Paul decoded as "TO LORY GR", "RGER LIST. JAMES AT", "DE JMT".

A website about this series contends that "the episode begins with somebody trying to decipher the Morse code being sent across to towns all over England following the wreck of the *Titanic*."

This seems likely, given the time-setting of the series. Can anyone comment?

Jakey, G3JKY/ZL2JKY writes;

"The worst ever was a TV mini-series, with Joan Collins as a spy in Monaco who was trying to send a message while the place was being strafed by three RAF Harvards which I'm sure were never more than training planes. Where they could have taken off from, I can't imagine! Joan's technique on the straight key would have ensured that she was relegated to the cook tent on Field Day! I can't remember the name of this fiasco, perhaps it's just as well!

"In the original print of *The Dambusters*, the code-words telling that the dams had broken came over a telephone and were OK. When I last saw the film, one of the code-words, which was the name of Guy Gibson's dog, had been cut out in case any of the politically correct brigade could read Morse!"

This is true. The code-word was "Nigger", and it appeared 12 times in the original print. I am told that a forth-coming re-make will substitute the word "Digger".

Marconi's sending speed

As I said in the last column, this has always intrigued me, since authoritative references state that his first, famous transmission could only have produced 2-3 sparks/second, each of which would be received as a single "click". It seems plausible that he would therefore have to send dits lasting several seconds.

Graham, ZL3GSL writes:

"I recently bought a box of electronics books at an auction. One book, *"Signor Marconi's magic box"* by Gavin Weightman, (Harper Collins, 2003) told me a few things I hadn't seen before.

"Unfortunately, GW doesn't give references, but he says that in 1897, Marconi demonstrated his system to the Italian navy at La Spezia. The dot time was 5 seconds, and the dash time was 15 seconds. My opinion has always been that the coherer/tapper detector could only have worked as a buzzer, so would have required a reasonably long pulse to be recognised. If this is the speed used in trans-Atlantic tests, it gave a better chance of discrimination between dot strings and random atmospheric noises.

"The messages sent for Queen Victoria from the Isle of Wight were sent fairly slowly it seems, and it was admitted that Marconi could not compete with the cable companies on speed.

"In June 1903, Fleming gave a public lecture in London, with live demonstrations, receiving signals from Poldhu. A naughty guy called Maskelyne transmitted some rude messages which disconcerted the guys setting up the equipment for Fleming. This upset Fleming, who complained to a newspaper. Maskelyne responded that he was demonstrating that the syntonic tuning did not give privacy or immunity to interference or jamming, which Fleming apparently was claiming. He also remarked that since the Poldhu station used a 50

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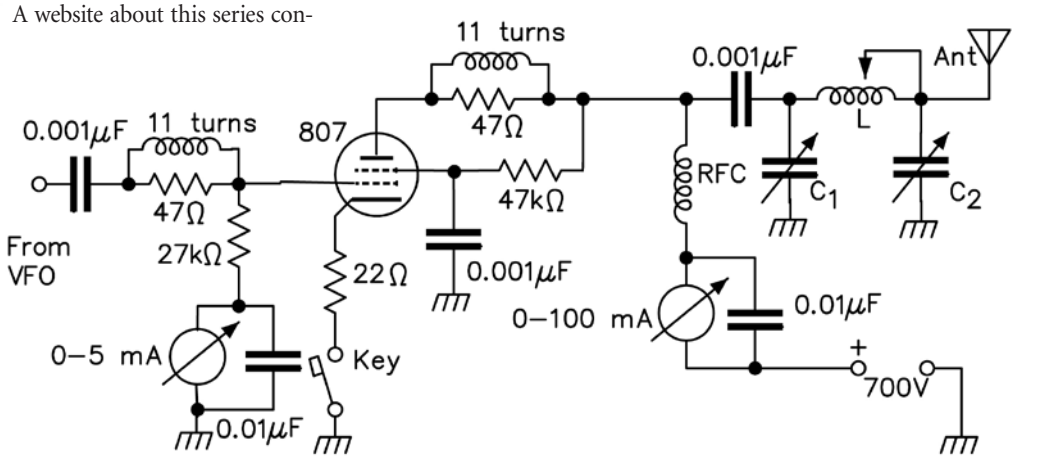


Figure 2. Class C output stage with single 807.

◂ continued from page 19

HP engine for power, at the signal rate of 2.5 wpm it would have been faster to use the 50 HP in a car, carrying the messages by road. Cheeky sod. Marconi's radio was not fast, it seems. Interesting."

The end of the matter

I've now looked at all the references I can find regarding Marconi's first Trans-Atlantic transmission. Bob, VE7BS has been very helpful finding material I'd not seen. The most authoritative documents available on the web are those by Jack Belrose, referenced in earlier columns. But neither Bob nor I can come to a definite conclusion regarding whether Marconi heard the signal or whether, as has been proposed, he heard only a realistic sequence of static bursts. My final inclination is to agree with Belrose, that he probably did not hear it. But it didn't matter, because he said that he did, and convinced financial backers to underwrite the wireless network he then developed.

I also mentioned in the last column that there was a significant error in my *LTSpice* simulation of Marconi's circuit as described in Ratcliffe's paper. The time-domain waveform is incorrect, since after the impulse, the voltage generator I used to excite it becomes a short-circuit, whereas a spark gap, after its discharge, becomes an open-circuit, so that inductive coupling between primary and secondary then ceases. Thus, after the spark discharge, the radiation characteristics would be determined only by the aerial system. Using Ratcliffe's simple antenna model, this would have radiated a damped wave at about 930 kHz, the antenna system's transient response frequency.

This is shown in the LTSpice simulation of figure 3, where I have substituted a current pulse source excitation, which shows the decaying portion correctly, since a zero-value current source is an open circuit. The short radiation burst during the spark is not modeled correctly, and would still have shown the double-humped frequency spectrum I showed two columns ago. However, Belrose's model measurements[2] show that Ratcliffe's simple antenna equivalent circuit is almost certainly inadequate, and this makes my LTSpice simulation dubious.

Until I learn how to realistically model a spark discharge, and can obtain a lumped-component model of Marconi's antenna system, there the matter must rest.

An iPhone Morse teaching app.

John, ZL1BYZ emails:

"I have been playing with a little App on my iPhone™ called *"CWSpeed"*. Not that I need the practice, but it's great while waiting in the car for the XYL. I just whip out the iPhone and run a couple of practice sessions off. It does all the right things like Farnsworth and uses the Koch method. The only thing I have noticed is that it repeats some characters much more frequently than others, and it's not because I get them wrong. I seem to remember you had a similar experience with some of your efforts with random character selection and came up with a solution to even the spread of letters sent, or am I dreaming?"

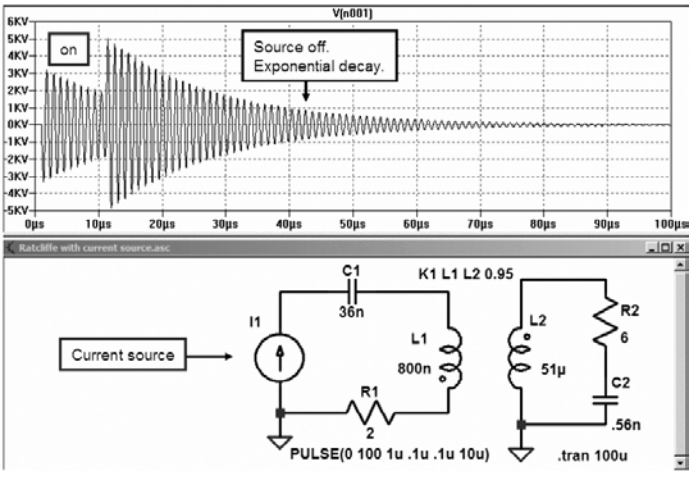


Figure 3. LTSpice simulation of Ratcliffe's circuit with current source, showing waveform decay.

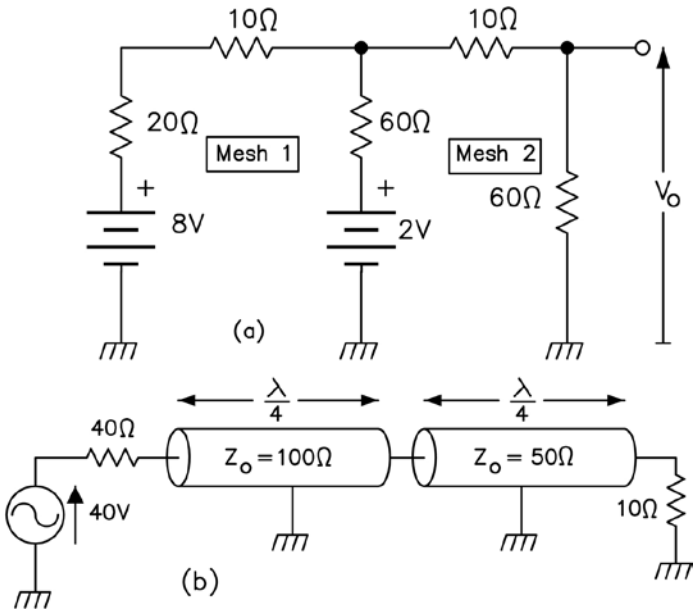


Figure 4. Top: Last month's problem. Bottom: This month's problem.

Being an old conservative, I do not have an iPhone, but if you have, you can download this app from the web[1]. Random character generation is a can of worms, and volumes have been, and continue to be, written about it. I've asked John to investigate further, because apparently "non-random" runs turn up in all generators. My Morse teaching software uses the supplied Delphi function, which appears to be quite adequate for the job.

Herman needs a Bug

Herman, VK2IXV writes;

"I am trying to get hold of a New Zealand A & W McCarthy bug key. In exchange, I have a 1940s Australian bug key "The Simplex Auto", made by Melbourne telegrapher Leo Cohen."

The McCarthy key is very rare. The key that Herman offers in exchange is also quite rare, and unusual in that the paddles emerge from the movement at right-angles. The idea was that the key would take up less room on a telegrapher's desk.

Last month's problem

See figure 4(a). This can be treated as a classical two-mesh problem. A plethora of correct solutions were submitted by Brian ZL1IE, John ZL2JPM, Basil ZL1TOW, Ross ZL3TFK, Joe VE7BFK, Peter ZL1AAM and Ron ZL1AI! The obvious method is to write down the Kirchhoff voltage equations for meshes 1 and 2, and solve for the current in the 60Ω resistor. This is 1/15 Amp, giving 4 Volt across it. We want a Thevenin equivalent circuit, and its output resistance will be the resistance seen looking back into the network with the 60Ω resistor removed and both batteries short-circuited. This reduces to 20Ω. The Thevenin voltage source must then have a value sufficient to force 1/15 Amp through (20 + 60)Ω, or 6 Volt. Thus the solution required is a 6 Volt battery in series with 20Ω.

A more elegant way (and the one I taught my students) is to replace the two batteries and associated resistors at left with a single battery and resistor using Millman's theorem, leaving a single mesh circuit. See the full solution on my web-page[3].

This month's problem

See figure 4(b). Another classical one! The 40 Volt RMS source at left is in series with a resistance of 40Ω and two lossless quarter-wavelength transmission lines having characteristic impedances of 100Ω and 50Ω, terminated with a 10Ω resistor. What voltage appears across the 10Ω resistor?

References

[1] Download the iPhone app from <http://www.liljenberg.net/cwspeed/>

[2] See Belrose's antenna model at <http://www.radiocom.net/Fessenden/Marconi_Reprint.pdf>

[3] See this month's solution at <http://www.qsl.net/zl1an/Downloads/downloads.html>

AREC – Amateaur Radio Emergency Communications

Geoff Gillman ZL3QR and Bev Gillman ZL3OV

AREC Mission Statement:
To be the preferred provider of Emergency Communications to New Zealand Emergency Services.

Hi, everyone. We have something a little different this time, essentially an overview of SAR communications. Enjoy.

The writer of this article, Jim Rowe, has been Communications Manager for 15 years in the Thames/Coromandel District. Previously Communications Manager for the Auckland area and at Whakatane, he has been involved in more than 200 searches. The contents of this article have been discussed with other experienced Communications Managers throughout New Zealand.

Search and Rescue Communications

You are called out to help with a search for a missing person or to help someone in distress. You are told to join a group of other people and to form a team. Someone hands you a radio and a GPS. "Do you know how to use them?"

"Yes," you reply "I have had training in operation of the GPS and sending and receiving messages."

"Good. Today we will be using channel 4 and the back-up channel is channel 22. You will be Team 4 and base will be known as Tararua Search Base."

You don't know what these channels are, or where the signals come from. You don't know how much thought went into deciding which channels to use for this operation – and you don't need to. Your team is assembled, gear checked, radio checks carried out and you are transported to where your tasking begins. All those skills acquired in many hours of training in search techniques are now put to best use.

Other people with different training have made the decisions on which repeater to use, where it should be located and which is the best site to use as base. If they get it wrong, you will have poor communications. Apart from the frustration and the difficulty in continuing with your task, you may well feel that your own safety is at risk.

It is very important therefore that the management team use their best resources to arrive at the most suitable of the alternatives available to them. These decisions need to be made very quickly. The safety and security of our search teams is paramount and the successful conclusion of the operation is the goal of all. Field parties are the eyes and ears of the Search Management team. Good communications are essential.

Resources available to the search management team for the best possible communications come under the following headings:

- Well trained and experienced Communications Managers.
- A dedicated team of experienced base radio operators and scribes.
- Access to suitable fixed repeaters or sites for portable repeaters.
- Reliable and well maintained portable and base radio equipment.
- Field party operators trained in the use of the radios and message handling.

Communications Managers

The Search Managers cannot be expected to have the time, or the skills to carry out all of the functions that may be required to bring their operations to a successful conclusion. As with other specialists used by the Search Managers, care should be taken to obtain the services of the best qualified and most experienced communications people to manage this aspect of their duties.

Once appointed, the Communications Manager should be consulted on matters concerning his functions:

- Location of Base for best communications.
- Allocation of space for the radio operators allowing for: Entry of aerial cables, Availability of power. Distribution of messages, Comfort.
- Expected search area and the siting of a suitable portable repeater.
- Primary & secondary radio channels to be used for the operation.
- Distribution and authorised source of messages
- Arrangements for the rotation of operators and hand-over procedures.
- Technical matters, including selection of frequencies, purchase and programming of radios.

Communication Managers should be encouraged to liaise with the radio people from neighbouring areas to ensure as much compatibility as possible in the event of joint operations or a major search. They would have different skills and could work together to solve any technical issues.

Once appointed to this position, it should be remembered that they are volunteers and will have spent much of their own time in testing repeater coverage areas, building and maintaining equipment at little or no cost to their Search and Rescue Group and training base and field operators. They have been trained in message-handling and have the knowledge and tools to carry out basic repairs. Their opinion should be valued above other well-meaning but less qualified members of your group.

Communication Managers should be encouraged to attend Land SAR courses whenever possible to give them an understanding of the terms and abbreviations used. Some existing Communication Managers have the MLSO qualification to help them identify with the organisation they work for.

Radio Operators and Scribes

Good base radio operators set the standard for the whole search. If an untrained person is used at base, standards can slip, degrading procedures for the whole operation. Ideally, a search should not be used for training purposes.

It is essential that all calls are attended to promptly. Long hours may be spent sitting and recording or transmitting messages. Operators should not leave their post while on duty and may not originate or amend messages. Base radio operation does not have the interest and attraction of work in the field or of making the informed decisions of the management team. Consequently, it can be difficult to keep up their interest and retain good people. It has been found that good operators are hard to retain.

On the other hand, the age and physical abilities of the base operator are not so important, as long as they have good ear-to-hand coordination, legible writing, and clear speech. The ability to blank out background noise and to concentrate for long periods of time certainly helps.

Incoming messages may either be written on SAR message forms, or by entering the details directly into a computer using the iMan programme. iMan log-sheets could be projected onto a screen or wall. Outgoing messages should all be transmitted from written message forms.

As a back-up, paper log-sheets should be kept by the operator to cater for the event that message forms may be lost, or a problem occurs with the computer or its power supply. Without the back-up of a manual log-sheet, the reconstruction of events or the loss of important messages could become a major problem. Experience has shown that the paper log-sheet has been invaluable. Some Coroners have stated their opinion that handwritten sheets are preferable as evidence of search details to the computer printed form. These log-sheets should be retained by the Communications Manager for 12 months. Photocopies may be handed to the Police to assist with preparation of their Pol.130 incident reporting forms.

Training of potential base operators should include the study of Section 5 of the SAR Field Guide and the setting up, dismantling and checking of equipment, re-charging of field radios batteries, emergency base and repeater batteries and storage of returned equipment at the conclusion of the operation.

Radio Channels and Repeater Sites

Channels 1 to 16 must be as described in the SAR Field Guide. This is a common bank of frequencies for use throughout the whole country and must not be altered. Additional channels may be added according to local availability and requirements. The availability of other emergency service repeaters in the region could be included, but it must be remembered that they own those repeaters and pay an annual fee for their licences to install and use them. We are required therefore to obtain approval in writing to

continued on page 22

continued from page 21

install those repeater channels in our radios.

There are also private repeaters in many areas that would help with coverage, but care should be taken in installing those channels in our radios, as those repeaters are only available for as long as that person or company is around to service the repeater and to pay the licence fee. Written approval from the owner is also required for the installation of those channels.

Ideally, all Communication Managers in a SAR district or region should try to standardise the channels installed in order that there is no confusion in any joint operation or exercise. This work should be carried out by a senior Communications Manager after consultation with others in his area. There are many different types of radio in use for Search and Rescue, and some are able to be programmed with more channels than others. Priorities must be set in order that the needs of all groups can be met as far as possible.

SAR should be a part of the emergency services community. The need for interaction between other emergency groups should also be considered.

Civil Defence and Emergency Management (CD)

Search and Rescue assistance may be requested in times of declared disasters such as providing flood damage reports, and communication for earthquake disaster recovery. Civil Defence has many repeaters in some of our search areas. They also own many portable repeaters on the Emergency Services Liaison Repeater channel (our Channel 12.)

NZ Fire Department and Rural Fire Committees (FIRE)

Inter-action with fire parties may involve major rural or urban fire situations and searches for fire party members who have become separated by fire flare-ups. SAR groups in parts of the country are actively involved with fire groups in their areas, but their members are required to undertake fire ground training before they can actively participate. The fire groups may also be willing to provide rooms and facilities for a search base. They may also provide extra radios and personnel for a major incident such as rural air accidents.

Department of Conservation (DoC)

Missing or injured work parties, hunters, rangers or trampers and visitors on DoC land. They have many repeaters giving good radio coverage in many of our remote areas.

Amateur Radio Emergency Communications (AREC) – Repeaters have been provided throughout the country that provide good radio coverage over many areas. These repeaters may be turned on for any emergency situation. (Channels 9 and 10). AREC also provides regular training courses for their members in message handling. Law changes, technical matters and upcoming developments are also discussed. Many SAR Communication Managers are AREC trained and have the required technical skills.

St John Ambulance Service

As a 'front line' service, St John Ambulance rarely, if ever, allows their repeaters to be used by other emergency services. Care must be taken to ensure that written approval is obtained before installing any of their channels.

Portable Repeater Sites

Portable Repeater Sites should be chosen with care. Experience from previous searches or SAREX activities will help identify the sites that give good coverage over the area to be searched and are accessible to vehicles. The high spots are not always the best. Keep portable repeaters well away from existing fixed repeaters to avoid problems with inter-action between repeaters and possible damage.

Coastguard and Marine Repeaters and HF Channels

Written permission is not required to operate on marine channels, but it is necessary for operators to hold a 'Marine VHF Operators Certificate' (MVOC). Where operation is required on the Marine HF channels, the operator must hold a 'Restricted Radio Telephone Operators Certificate' (RRTOC), bearing in mind that Taupo Maritime Radio monitor most of these frequencies and will be the control station for any maritime emergency traffic. Extra care must be used in handling messages on these channels; there are specific and detailed procedures, especially in an emergency situation.

Reprogramming of Base and Field Radios

Any request for changes to the programming of channel frequencies must be directed through the Communications Manager. In most instances, it is he who has the local knowledge, computer software, special cables and expertise to reprogramme the changes required. The lives of searchers or distressed members of the public may be at risk if a wrong decision or programming error is made.

Maintenance and Replacement of Radio Equipment

The Communications Manager or someone appointed by him should regularly check all equipment in order that it will be ready to use for the next search. Aerials and their connectors should be complete and clean, batteries should be kept charged and have contacts cleaned at regular intervals. The channels installed should be checked to ensure that they are correctly programmed. Repairs should be carried out or arranged promptly.

The need for replacement or new equipment should be noted and referred to the committee for their attention. All equipment should be stored carefully to avoid damage and so that it is ready for any requirement.

Training of Field Personnel

It has happened many times that a field party has been transported to the start of their tasking before it was found that they could not speak to anybody on their radio. This can be for several reasons. In one instance, there was dry vegetation at the base of the aerial socket. In another, they had not taken the aerial at all. Other instances have involved flat batteries or a corroded battery contact. Some groups have not written down the channel number to use, or have found that the radio was 'locked' and they could not remember how to unlock it and change the channel.

Good radio training is critical for the success of our mission. There is not much point in being the 'eyes and ears' of the search controllers if we cannot communicate that information.

With the right training, ninety percent of radio failures could be fixed in the field. If two teams have traversed the same valley and it was found that one had radio contact with base and the other did not, it will generally be found that one team had better radio training than the other.

Message handling procedures are also variable. Well-trained teams are immediately obvious to the base operators. Passing on information is the priority. The manner in which it is transmitted identifies those team members who may need further training.

Be safe. Be successful. Enjoy your share of the pleasure of a successful result.

We are all one team.

Jim Rowe
ZL1AVR / ZK1EI

Activity Briefs

(A selection from July/August)

2/07/11 Hamilton Branch 12. Sports & Training. Cambridge rural area. Safety communications for the North Island Secondary School Cycling Championships for two days, 2/3 July 2011. Very successful communications to all points on the course. There were quite a number of falls in the close vicinity of our radio points but no major problems. There were 765 cyclists involved from 161 schools.

7/07/11 Christchurch Branch 05. SAR. Ashley Gorge, near Oxford, North Canterbury. Missing trapper (83yr old) – Alan Hill. No result, search stood down after seven days.

15/07/11 Papakura Branch 65. Sports & Training. Town Basin Whangarei. Provide safety tracking information for the Rally of Whangarei. Good HF and VHF comms all weekend

16/07/11 Northland Branch 28. Sports & Training. Waipu/ Paparoa, Northland. Rally of Whangarei. Two days providing Safety Communications for the international Rally of Northland.

31/07/11 Otago Branch 30. SAR Training. Heyward Point, 2.5km

NW of the entrance to Otago Harbour. Take part in a SAREX with Dunedin Marine Search and Rescue. Radio communications was provided between the search area outside the harbour and the base at the Port Chalmers Yacht Club via the Marine Ch 62 repeater. The ESB 164 repeater was set up to provide safety communications to the missing parties.

6/08/11 Otago Branch 30. Sports & Training. Owaka, South Otago Assist BR08 with the Catlins Coast Car Rally. The BR 30 portable repeater and five operators went down to assist with safety and timing information from the start, centre and finish positions of the rally.

6/08/11 East Southland Branch 08. Sports & Training. Catlins, South Otago. The Annual Catlins Car Rally. There were 76 cars started the first stage and only 56 finished the day. No serious accidents, just a few left the road and most were mechanical retirees. A total of 18 Amateur radio operators, from four NZART branches, provided comms for eight stages for start and finish times as well as safety tracking. 12 RT's were set up for rally management on the local district council network. Two STSP repeaters were deployed by helicopter. The day went very smoothly. Thanks to all involved.

17/08/11 North Otago Branch 64. SAR. Kurow, North Otago. Missing 35 yr old male on quad bike checking on stock in the snow in the Kurow area. Set up base at house of missing person. Sent two 4WD vehicles for initial search and helicopter with night vision goggles. Found missing person in hut at 2.30AM and was airlifted out.

19/08/11 Northland Branch 28. SAR. Western Hills, Whangarei. Search for two males who phoned in to say they were lost. Found by searchers just after 22:00.

20/08/11 Thames Branch 41. SAR Training. Thames – Monument Hill and Waiotahi Track. Mini SAREX behind Thames for training in GPS, map and compass, TCA and radio. Excellent training for new members.

20/08/11 Tararua District Branch 06. Sports & Training. Te Awa Road, Waipukurau. Hawke's Bay Car Club Rally. Man radio point at finish of Special Stage 5. Stage run twice due to Special Stage 2 being cancelled.

21/08/11 Tararua District Branch 06. Sports & Training. 5.3Km into Waipunga Road from SH5. Hawke's Bay Car Club Rally. Man radio point at end of Special Stage 8 and Special Stage 11.

22/08/11 Southland Branch 37. CD Training. New Zealand Red Cross, Invercargill base. Provided basic radio training for ten members of the Southland Red Cross Response Team. Lesson included topics of the following: radio procedures, radio pro-words and call-signs, transmission principles and techniques. Finished with a brief radio exercise.

25/08/11 East Southland Branch 08. SAR Training. Dolamore Park, Gore. LandSar Training. Various activities were set up to keep members up to date on new methods and brush up on old methods. Instruction/lecture on CIMS, VHF & HF Radio, tracking, map and compass, GPS, identifying clues, etc.

27/08/11 North Canterbury Branch 68. Rural Fire. Ashley River, Loburn. Scrub Fire. Two forestry fire units (4WD) to assist NZFS and Rural units in difficult to access area. AREC provided comms/logistics for forestry units.

Conclusion

Thanks to those who have contributed to this issue. Material for the next one to please be in our hands by 3 November. Photos, if included, preferably on a separate CD (with captions) mailed directly to us. E-mail pix may be acceptable but will be at the Editor's discretion and must not be embedded in the text. Contact details: <zl3qr@nzart.org.nz> or <zl3ov@nzart.org.nz> or post to 6 Boyd Street, Rangiora 7400, or phone (03) 313 7137.

Reminder

The next Section Leaders Nets should be 17 October and 21 November, 3900 kHz USB at 2030 hr NZDT unless notified otherwise.

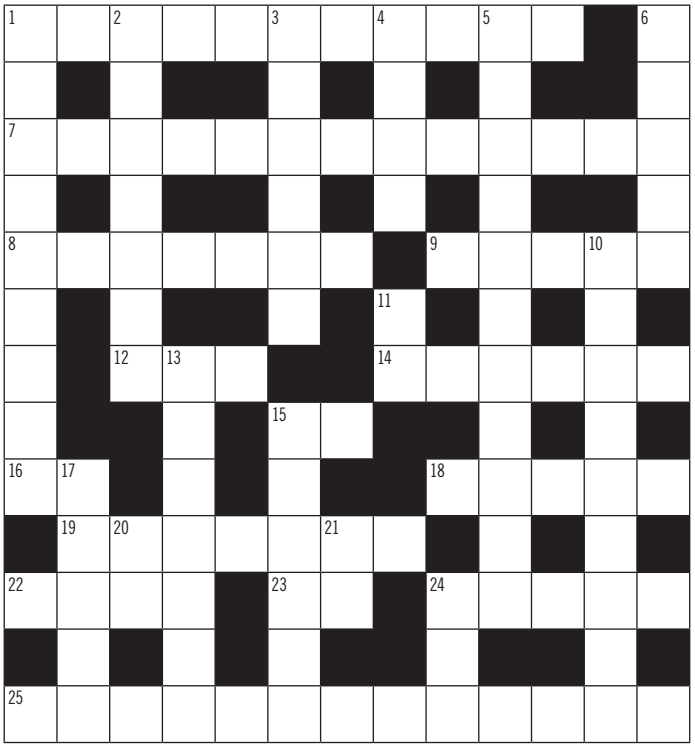
Until next issue,

73, *Geoff ZL3QR & Bev ZL3OV*

ZL Crossword No. 13

Compiled by Graeme Hunt ZL1ANH

email <graemeh@xtra.co.nz>



Across:

1. Receiver needs this to hear weak signals (11)
7. Did I hear a noise or not? ZL scenic attraction (8,5)
8. Tedium, maybe the bands are dead (7)
9. Lone Ranger's native American mate (5)
12. Slack airport (3)
14. Half wave antenna, usually centre fed (6)
15. Phone home from Addis Ababa, prefix (2)
16. Common to Shortland, Coronation and the Sudan (2)
18. One effect of I passing through R, it _ (5)
19. It turns the antenna (7)
22. Wanganui's Virginia ____ (4)
23. Digital state (2)
24. Entice (5)
25. Set up your radio equipment on this (9,4)

Down:

1. Where the information is with AM transmissions (9)
2. One of the 3 wires in an AC mains lead (7)
3. Polytetrafluoroethylene (6)
4. One watt, divided by one amp (4)
5. From the ground to about 10 km (11)

6. & 10. down RTTYs (5,8)

11. Capital is Beirut, prefix (2)
13. What you are, if licensed (7)
15. Demand by menaces (6)
17. Hike in the bush, ZL term (5)
20. Agree in Prague , prefix (2)
21. Flick the switch in Brussels, prefix (2)
24. Vandalise, usually with a spray can (3)

Answers on page 40.

Next deadline for copy is **10 November**

Longer Wavelengths

Con Wassilieff ZL2AFP
<zl2afp@nzart.org.nz>

ZLW centenary (1911-2011)

The Wellington Amateur Radio Club's (WARC) commemoration of the centenary of the Wellington coastal radio station ZLW went ahead on the 26th of July (the ZLW anniversary date) with Bob ZL2CA initially transmitting plain Morse code at 12 wpm from 7-10pm but later changing to QRSS3 (slow Morse code with 3 second dot length), mainly for the benefit of VK listeners. As the east coast of VK is two hours behind ZL time, QRSS3 beacon transmissions were made from 9:30pm until midnight to give opportunity for VK listeners to get good signal strength.

Transmitted power of 75 W at a frequency of 505.1 kHz into an electrically short inverted L antenna provided a radiated power of about 1W. DSP reception of QRSS3 using Argo gives an "integration advantage" of about 15 dB compared with conventional Morse code. Simple on-off keying was used to reflect former ZLW operation on 500 kHz. Good QRSS3 copy was reported from VK1, VK2, VK3, VK5 and VK7. To cater for reports of conventional copy by ear the last two Thursday beacons changed to 12 wpm at 11:30 pm. A VK2 gave a 559 report for the ZM100ZLW 12 wpm beacon.

VK temporary experimental licences for 600m have since expired and are not being renewed. Activity has moved to the 136 kHz band.

Class D amplifiers

The main topic for this column will be efficient power amplifiers for the 600m band. Any practical antenna for the 600m band will inevitably be short compared with the signal wavelength. A top loaded vertical is probably the best way of converting some of the power delivered into the antenna into radiated power. Even with a vertical of decent height, say 10m, the maximum allowable 25 W ERP is not likely to be under threat with the output power available with a typical home-brew amplifier.

To be able to be received reliably up and down ZL RF power into the antenna of a hundred watts or more is desirable.

Bob ZL2CA has been experimenting with reduced bias for an enhancement mode MOSFET final, shifting from Class AB2 linear towards Class C, and increasing the maximum power output accordingly, as well as reducing dissipation. This was a welcome increase in power for ZM100ZLW beacon transmission. Harmonics were under control by a 7-pole low pass filter and a sharply resonant antenna tuning system.

Higher efficiencies of up to 90% can only be achieved with "switch mode" amplifiers. Whereas Class C amplifiers are driven with sine waves, switch mode amplifiers require square wave drive, generally provided by driver IC's designed to switch large currents on and off very quickly. The key to high efficiency is that the MOSFET acts as a switch; it is either "on" or "off". If the MOSFET is selected for low drain-source resistance (typically 0.1 ohms or lower) power dissipation in the MOSFET is low and large heat sinks are not required. As long as the drive to the gates of the MOSFETs is maintained as a perfect square wave, efficiency will be high. However, high current power MOSFETs used for Class D amplifier service tend to have high gate capacitance (typically 2000-4000pF) and so the driver must be capable of supplying high peak currents (up to several amps) to be able to charge and discharge the gate capacitance quickly and hence maintain the ideal square wave drive.

Now switching an amplifier on and off very quickly produces significant harmonic output, requiring low pass filtering to eliminate the harmonics by reflecting back the harmonic energy. This reflected harmonic energy helps to maintain the square wave and thus the high efficiency of the amplifier. Up to 90% of the total DC input can be converted into RF energy at the fundamental frequency. This can only be achieved by correct low pass filter design. The low pass filter has to be considered as part of the output stage.

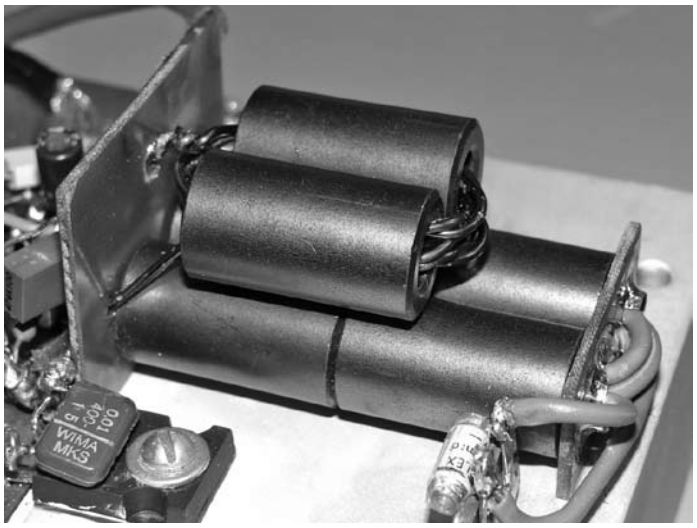


Figure 1. Output transformer (bottom) and DC feed choke (top).

Graham ZL1QM has built a Class D push-pull amplifier based upon the design by N4ICK[1]. A novel feature is the use of tubular ferrite cores (Jaycar LF-1260) for both the output transformer and the DC feed choke. Graham's intention was to build an amplifier entirely from locally available components, hence the Jaycar™ cores.

Class D operation can be achieved with a single active device but there are advantages in using two devices in push-pull. The main advantage is that the second harmonic is inherently low, potentially reducing the low pass filter requirements. The other advantage is that the high voltages generated by the switching amplification process are shared across two transistors, thereby allowing MOSFETs with lower maximum drain-source voltage to be used (switching high currents in an inductor produces high voltages).

The waveforms at the input and output of Graham's low pass filter can be seen in figure 2.

The output waveform with no filter is pretty much a square wave, but the effect of a low pass filter is to change the waveform into something only vaguely representing a square wave. After all, the energy reflected back by the low pass filter has to go somewhere!

The 390pF capacitor across L2 resonates with L2 and provides additional attenuation of the third harmonic. With this low pass filter

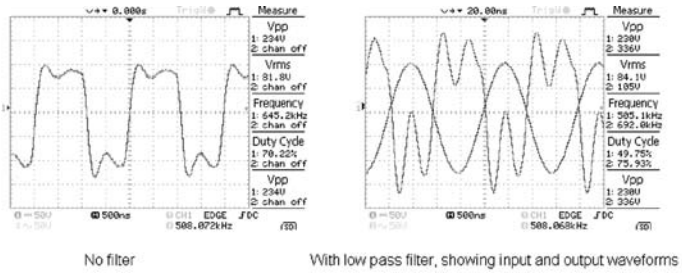


Figure 2. Output waveforms from the ZL1QM Class D amplifier.

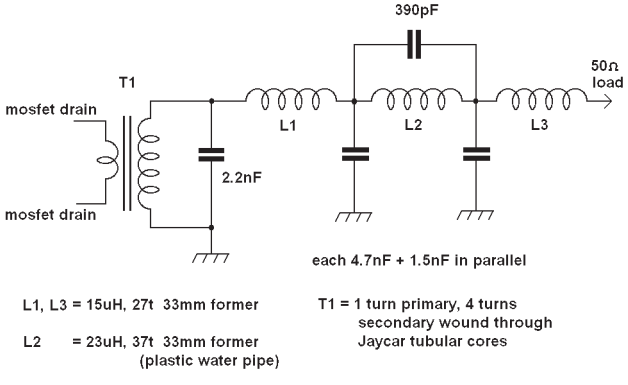


Figure 3. ZL1QM low pass filter.

and the N4ICK amplifier Graham achieved 73% efficiency. An advantage of this design is that if the load is removed for whatever reason (such as the antenna falling off!) the DC current through the MOSFETs drops to a low level and protects the amplifier from cooking. Graham reports that everything stays moderately cool, even with the design 140 W to the load. All capacitors are 600 V polystyrene types.

I have not had as much success as Graham with keeping the Jaycar tubular output transformer cool, so have instead used salvaged switch mode power supply transformers in my Class D amplifier. It is feasible to use only the transformer cores, rewinding as necessary to suit the amplifier, but I found that the windings were pretty much fine as they were. One needs to identify the individual windings but this is easily done with an ohmmeter and a home-brew impedance bridge. Even a very small transformer can be used at output powers of 80 W or so with the windings only getting to just warm.

A supply of salvaged transformers from an old inverter power supply was made available by ZL2CA. Two of these connected with the primary windings in parallel and secondary in series enabled good impedance matching and high output power with minimal heating of the transformers. Adjustment of the low pass filter components resulted in power output of 450 W momentarily before the fuse blew on the power supply! Efficiencies of over 90% were measured, using a simple pi-section (3-pole) low pass filter. Unlike with the ZL1QM design, removal of the load in my design did not result in reduced DC current, so there is no inherent protection for the amplifier in the event of an antenna failure.

Almost any power MOSFET can be used, although devices with drain-source on resistances of less than 0.1 ohms are preferred for best efficiency. The voltage and current carrying capability are also factors that need to be considered. DC currents of 10 A or more can be expected. The circuit in figure 4 is of my current amplifier, using STW34NB20 MOSFETs (200 V maximum), although the IRF540 (100 V maximum) has also been used successfully. The low pass filter capacitance and inductance has been adjusted from the textbook values to suit the particular output transformer.

An oscilloscope is essential equipment when adjusting parameters for maximum PA efficiency. A high power resistive dummy load is also needed, as is some means of measuring either the RF current into the load, or the RF voltage across the load (the oscilloscope will do this as long as it is calibrated).

Figure 5 is a photo of the general layout of my amplifier, with driver circuit attached. As can be seen there is not much to it. This particular circuit uses two transformers in series-parallel to share the load and provide better matching of the low drain impedance to the 50 ohm input impedance of the low pass filter. The optimum transformer turns ratio required depends upon the supply voltage and current drawn. Although the MOSFETs are attached to a massive heat sink, this circuit does not really require it as everything remains only mildly warm even under sustained 200 W output.

The Schottky diodes across the gates of the two MOSFETs are essential. In all likelihood 1N4148s could have been used but I have not tried these in this circuit. I have tried a range of output transformer types and have achieved high RF power out but so far only the salvaged SMPSU transformers have remained cool in operation.

600m net

The Thursday evening 600m net continues to meet weekly on 3666 kHz at 8.30pm. Contributors to the net have recently included ZL1QM, ZL1BPU (operating as ZL1EE), ZL2CA (operating as ZL2T), ZL2AFP (operating as ZL2EE), ZL3JE (operating as ZL3EE) and ZL4MD.

Propagation conditions during the last week of August and first week of September as of the writing of this column were exceptionally good, with generally low QRN and strong copy from all stations participating.

References

[1] <http://www.500kc.com/N4ICK/index.htm>

FMTAG – Frequency Management and Technical Advisory Group

Secretary: Doug Ingham ZL2TAR
<fmtag@nzart.org.nz>

Proposals

None this month.

Final recommendations

Published as Proposals on the NZART website and in HQ Infoline 235. No comments have been received.

Branch 25 Napier has applied to change the channel, and invert the input-output frequency split, of its 8425 repeater located at Taraponui, Topo50 map reference BH38 233618. The repeater's transmit frequency will be 434.050 MHz and its receive frequency will be 439.050 MHz.

ZL2AJ has applied for an APRS Digipeater located at Kauahei Topo50 map reference BL38 166828. The digipeater's transmit and receive frequency will be 144.575 MHz.

Comments and applications

Please send your comments and suggestions on the above matters, and on any other FMTAG matters, by e-mail to: <fmtag@nzart.org.nz>

Applications for repeaters, beacons, digipeaters, point-to-point links, and so on, should be made on the latest version of FMTAG Form 10. The latest versions of FMTAG Form 10, and the explanatory Form 10A, are available on the NZART website: <http://www.nzart.org.nz/fmtag/index.html>.

Completed forms should be sent by e-mail to <fmtag@nzart.org.nz>.

NZART CONFERENCE 2012 BRANCH 26

Tahuna Beach Conference Centre, Nelson
Queen's Birthday weekend (1-4 June 2012)

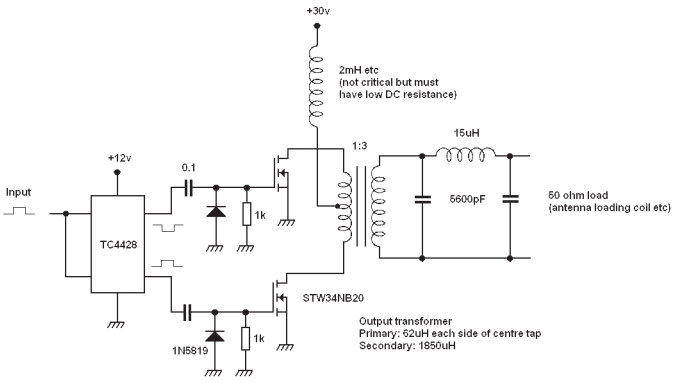


Figure 4. ZL2AFP Class D amplifier circuit.

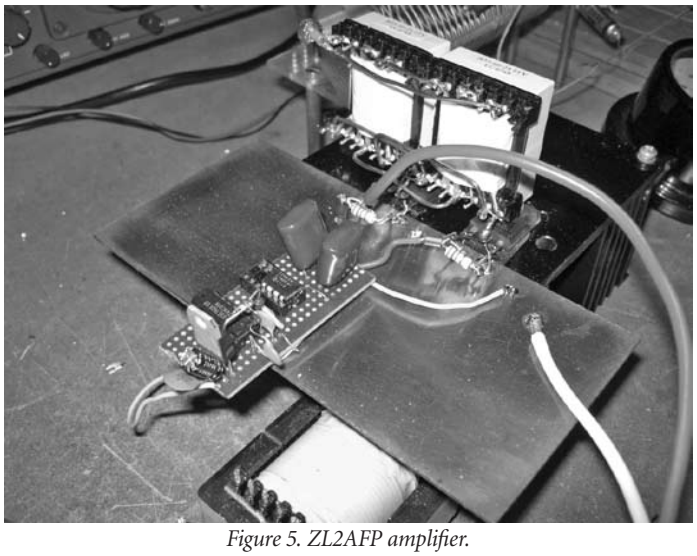


Figure 5. ZL2AFP amplifier.

VHF Scene

Simon Watt-Wyness ZL1SWW
<zl1sww@nzart.org.nz>

Welcome to this edition of VHF scene. This one maybe a bit thinner than usual due to my heavy work commitments and having spent quite a bit of it out of town. With the winter months slowly closing to an end soon, there have been some activities but we hope to see some rise in trans-Tasman and other contacts as the summer months come closer.

6m Happenings

Despite winter, there have been some openings on 6m to various places.

- 4 July; Peter ZL4LV worked VK3DUT and next day VK3DUT was hearing Mark ZL2WHO.
- 7 July was quite busy with ZL3ADT, VK3ZAZ, VK3KH, ZL2WHO, ZL3NW having QSOs.
- 11 July saw ZL3NW working into VK5 and VK2.
- 16-19 July Bob ZL1RS worked VK3DUT, VK4EK and Vk4WTN.
- August continued much like July with many more contacts between VK & ZL with the ZLTV and ZL3SIX beacons doing a great job of propagation indicators.

2m and above

2m has been going on with a lot of contacts via meteor scatter (MS) with activity between VK / ZL from the usual stations active being, ZL3CU, ZL3TY, ZL4LV to VK2, 4 and 7.

There were some satellite contacts to VK via AO7 and FO29 from ZL3MH and ZL2LN. 23 August saw Nick ZL1IU cracking into VK2 working VK2DVZ and VK2BCC. At the same time Steve ZL1TPH is hearing the 144.275 Wellington beacon coming into Auckland at 520 km. As well Steve has been testing his new VK3XDK 3400 MHz transverter with good results.

The big news is that Bob ZL3TY received his 2m DXCC certificate. Congratulations go to him, as this is a first for ZL, Oceania and possibly the Southern Hemisphere. Bob Reports on some of the technicalities overcame to achieve 2m DXCC.

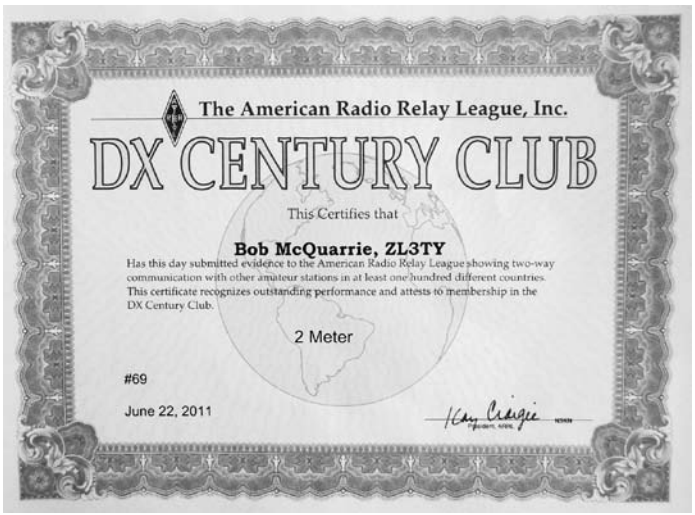
DXCC is recognised as the premier HF DX award and to get it on 2m requires use of EME (moon bounce) to work the required 100 countries. The first 2m DXCC went to W5UN in January 1991, using CW and a 24 Yagi antenna array. New Zealand has been at the forefront of 2m EME from its beginning when ZL1AZR contacted SM7BAE in 1966, creating a record which stood for many years. On 22 June 2011, 2m DXCC #69 was awarded to ZL3TY, a first for ZL. The list of 2m DXCC recipients can be seen at <http://www.arrl.org/system/dxcc/view/DXCC-2M-20110818-A4.pdf>.

In 2002, as sunspots declined and 6m F2 DX disappeared, I decided to give 2m EME a go. I had already tried 6m EME, my first QSO being with SM7BAE. At this time WSJT software was under development by K1JT with JT44 becoming a popular EME mode, before this CW was used. As the WSJT software was developed JT44 was superseded by JT65b with improved sensitivity.

It was clear that an effective 2m EME station needed a 4 Yagi antenna array and QRO. My initial activity was with four 12 element K1FO Yagis and a 160W brick located at the antenna which yielded 12 QSOs but after many unsuccessful skeds it was clear that more transmit power would improve results. After constructing an amplifier using a GU74b with 500W output, results improved markedly. My QTH has an unobstructed horizon over the sea at moonset which coincides with my window into Europe. At times this results in spectacular increase in signal strength as the moon approaches the horizon. Many stations have been worked who were using single Yagis, the smallest station worked used just 100W and a 10 element Yagi. When I started on EME it had been several years since a ZL was active on 2m so there was no difficulty finding stations to work.

Some of the machined parts for the 1296 MHz GS15B amplifier under construction.

The antenna array is 10m high and exposed to strong wind and rain at times. An initial problem was keeping water out of coax connections, water in the coax required replacement of the phasing lines. An exceptional period of high winds in May 2010 resulted in the pipe mast bending, by the time the winds abated the whole system had a 30 degree lean. A week of hard work dismantling the antenna, repairing the pipe and reassembling the array had it all working again in time to work the 3B8EME DXpedition.


The American Radio Relay League, Inc.
DX CENTURY CLUB
This Certifies that
Bob McQuarrie, ZL3TY
Has this day submitted evidence to the American Radio Relay League showing two-way communication with other amateur stations in at least one hundred different countries. This certificate recognizes outstanding performance and attests to membership in the DX Century Club.
2 Meter
#69
June 22, 2011

Bob ZL3TY's 2m DXCC Certificate – a first for ZL

Activity on 2m EME has grown in recent years as more stations try the JT65b mode. A well equipped station can operate at moonrise and moonset without the need to elevate antennas.

My first EME QSO was with W5UN on 16 June 2002, DXCC #100 was VK9NA worked on 9 January 2011. Other stats:

EME QSOs	1214
Initials	653 (individual stations worked)
Grid square	402
DXCCs	109

Microwave Activity

Peter ZL1LV report some constructional projects and other activities.

Interest in the 23 cm (1296 MHz) band has developed in Dunedin with at present about nine locals able to either fully or partially operate on this band. Equipment ranges from a Varactor Tripler from 432 MHz , a transverter From VHF Comms magazine , home built gear to commercial rigs. As the interest develops this involves the construction of better aerials and the completion of unfinished projects.

One of the major construction projects under way is a pair of 250 W linear amplifiers for David ZL4DK and Hugh ZL4HL using Russian GS15B valves. This project involves a significant amount of lathe work as well as the need to scrounge the suitable pieces of brass and copper of the right shape and proportion. David is a good scrounger and my mechanical workshop facilities have been put to good use.

As usual winter activities have been rather quiet, there have been a few 6m contacts into VK; VK3DUT

Satellite Orbits

Andrew Barron ZL3DW
<ad.barron@xtra.co.nz>

ARRISat-1 is proving to be very entertaining with many hams listening to the recorded voices and downloading SSTV images in ROBOT36 mode and I presume using the linear transponder. The ARRISat website is at <http://www.arissat1.org/v3/>. The battery is failing more rapidly than expected and the satellite seems to be having difficulty reading the SD memory card which holds the recorded messages. At present the downlink is strong and can probably be received on a handheld, but there are deep fades due to the satellite tumbling which affect the capture of the SSTV images.

Keeping AO-51 operating requires the US command team to routinely restart the satellite, and tweak the power settings to find a combination of operating parameters to get it through eclipse. Currently one of the six battery cells onboard is shorted and another is in really poor shape. According to the control station, "The onboard computer was crashing each orbit because of low voltage when the solar cells were no longer receiving illumination and the satellite relies entirely on its internal battery power. Through experimentation the Command Team seems to have found a balance point where it will sometimes go up to two days before crashing." Each time the computer crashes the Command Team has to restart it using the housekeeping software onboard in ROM. The firmware code has a limited functionality compared to the normal flight software which we would upload from the ground over a few days. However the eclipses and battery problem were causing a crash before the upload can complete. With lots of luck we will be able to continue to limp along. For how long is anyone's guess. I'd encourage you to use AO-51 while it's available, and to financially support new satellite programs like Kiwisat, Funcube, and Fox when you can." Uplink: 145.880 MHz, no tone. Downlink: 435.150 MHz The repeater is open to all when the satellite is operational.

Japan's Fuji-Oscar FO-29 amateur radio satellite passed its 15th birthday on 17 August. Thanks to the careful power system management by the operating team the analog repeater continues to function well.

CubeSat statistics: the first was launched in 2003 and since then more than sixty have been launched and at least forty are still in orbit. Apparently there are at least 200 current projects, although it is not expected that all of these will reach a launch pad at any time soon. Eight different launch vehicles have been used so far and three more have CubeSats currently manifested.

The next 'big thing' on CubeSats will be the introduction of, "electric propulsion" systems. These micro-propulsion systems will compensate for orbital drag and extend the life time of the satellites and can also be used for attitude control, (ie to stop the satellite tumbling). In the future it should be possible to use these systems to take a future Oscar CubeSats to a higher orbit to provide longer range amateur communications. One team was talking of a system that had a mass of 290g plus 200g of fuel. It would consume 13 W and provide 200 μN

Figure 1. Spectrum of the ARRISat-1 transponder showing the BPSK beacon, linear transponder and FM downlink.

continued on page 28

Norm being a regular. Meteor scatter test are still being perused each Saturday morning for an hour starting at 2000 hr. Results have been rather poor with few meteors, at least for us in the south.

I have managed a few EME contacts on 2m with my tally now at 26 countries worked. When you think about it working countries on 2m a few years ago would be unheard of. Thanks to modern technology and available gear this is now possible. It does take some patience though and one is working at extreme limit of the equipment.

The scribe has been working on another 5760 transverter brick as there appeared to be problems with the other unit that was installed in the ODU (Outdoor Unit) that mounts to the back of a 60cm dish. Rather than beat around with a partially working unit, I decided to start again with a new drop in module. These are the DXR700-768 modules.

In past columns, I had mentioned a project for an RF power meter. Putting it along side the Marconi meter, I find with the diode sensor at 5760MHz, it is only 1.5dB off above about -10dBm. Not too bad for a ham shack project and gives good relative readings.

Steve ZL1TPH has been plugging away at a new 3.4 GHz transverter kit project. He updates us on progress …

A new microwave transverter for the 9 cm band (3.4 GHz) was recently constructed using the transverter boards designed and produced by Graham VK3XDK. This transverter also includes his PLL board for oscillator injection that is referenced to either the internal 10 MHz OCXO mounted inside the transverter box itself, or external optional GPS reference via BNC connectors at the rear.

The 9 cm amateur band allocation spans from 3300 MHz to 3410 MHz in New Zealand. The IF or intermediate frequency chosen is 432 MHz with an FT817 radio for 3400 MHz with all mode capabilities. This project was to place another working transverter on this band allocation and to the best of my knowledge there are another nine operational 3.4 GHz capable stations in ZL at this time.

Two FUJITSU 3.9 GHz GAs-FET power amplifiers were acquired surplus and modified with added inbuilt minus volt inverters for +12 volts only connections externally and then flaked for the best down on 3.4 GHz. These where then combined with 3 dB SMA couplers for an output power of around 8 W. Both PA's are mounted back to back.

Tech Talk …

Terry ZL4TAE subscribes to product alerts from RFMD and they have a heap of devices which are of interest to VHF through to microwave users. The website is <http://www.rfmd.com/>.

Vaughan ZL1TGC brings to our attention, a new device from NXP touted as the "First Indestructible Transistor" This is the BLF578XR, the XR standing for Extra Rugged. This is an LDMOS device capable of running up to 1.2 kW of RF output. Frequency range is from 10 through to 500MHz. They released a video demonstrating the load disconnected and even the output shorted with the RF amplifier in full operation, without so much as harming the transistor. Typical operating voltage is 50V and the device has integrated ESD protection. Check it out on the net at <http://www.youtube.com/watch?v=8ziYqjMQGEQ>

2011 VHF-UHF-SHF Contest Calendar

Microwave Contest. All bands 614 MHz and up. Saturday 1 and Sunday 2 of October.

Field Day Contest. All bands 50 MHz and up. Saturday 3 and Sunday 4 of December.

For all contests, the operating periods are 1700 to 2300 on the Saturday, and 0700 to 1300 on the Sunday, NZ local time.

The complete Contest Rules are available at: <http://www.vhf.org.nz/pubs/Contests/VHF-UHF-SHF-ContestRules>.

Summary

Acknowledgement and thanks; to ZL4LV, ZL3TY, ZL1TPH, ZL1TGC and others for input for the column.

If you have input and pictures for the columns ahead; such as DX activity reports, repeater installation, branch activities, snippets of interest, technical items etc, please send to Simon ZL1SWW <zl1sww@nzart.org.nz> or *Call Book* addresses. (I also accept large picture files sent via email).

continued from page 27

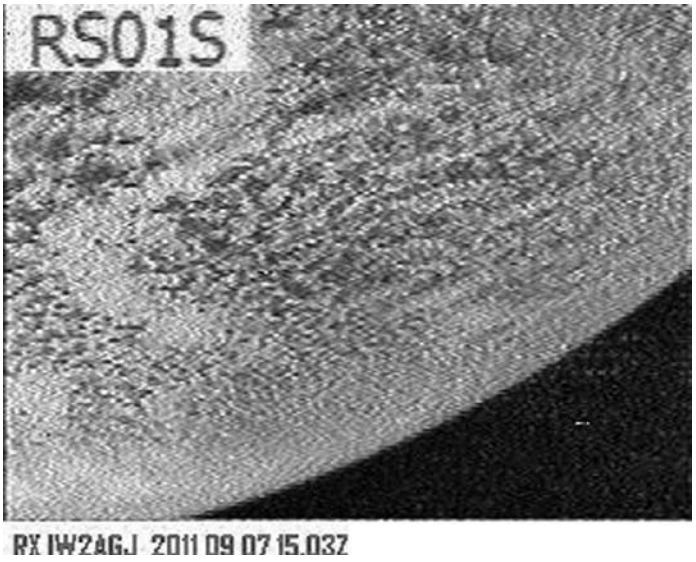


Figure 2. A ROBOT-36 SSTV picture received from ARRISat-1.

of force. These numbers would appear reasonable in the context of a 3U CubeSat and it was claimed that this sub-system could raise the orbit of a CubeSat by some 2000 km over a period of only 13 days! Mars Space Ltd has proposed an electric propulsion system as a payload onboard the UKube1 CubeSat mission. The propulsion subsystem consists of a Pulsed Plasma Thruster (PPT) able to provide a total impulse big enough to compensate for the drag acting on a 3U CubeSat for three years. The system has already been developed and tested under ESA funding by a consortium formed by Clyde Space, the University of Southampton and Mars Space Ltd. The entire propulsion module has a mass of 200 grams providing 17N of thrust per Watt of available power. Flying this system onboard UKube1 will provide a unique opportunity to test for the first time the use of electric propulsion onboard a CubeSat.

SA AMSAT is planning two CubeSats satellite projects, with totally different design approaches and time lines. The first project will focus on providing a FM transponder that will be available on most passes over South Africa and will have a short time line to launch (2012 – 2013). The FM Transponder CubeSat which has been provisionally named KLETSkous will be based on a standard available space frame and sub system with a locally designed payload. The project will be coordinated by Hannes Coetzee ZS6BPZ. They have also launched an innovative satellite project and are inviting the participation of South African Universities of Technology in the development and construction of a completely South African Amateur Radio experimental satellite. The objective of this satellite is to demonstrate South Africa's ability to engineer a satellite, employing the latest technology and new innovations. In addition there are some feasibility projects for future commercial use. The name SA iSAT has been taken from the name imagination satellite. SA iSAT is a very involved project testing the limits of ingenuity and technology.

The reason for the decision to go the CubeSat route has only one dimension–financial. Launch opportunities are available at reasonable cost. However going the CubeSat route has restrictions including a very low power budget, very little space; 100mm square inside the cube, low mass specification, and the lack of opportunity for a platform stabilisation system. SA iSAT overcomes these problems while still complying with the mechanical specification of the CubeSat format. It will use fold out panels, a total of 24 in all, that support solar panel steering in order to capture the maximum energy available from the sun. The rear of the solar panels is free for project use. Potentially 24 projects depending on size can be accommodated. In addition the centre core of the Cube is still available for a large battery component. The power budget is to be evaluated but

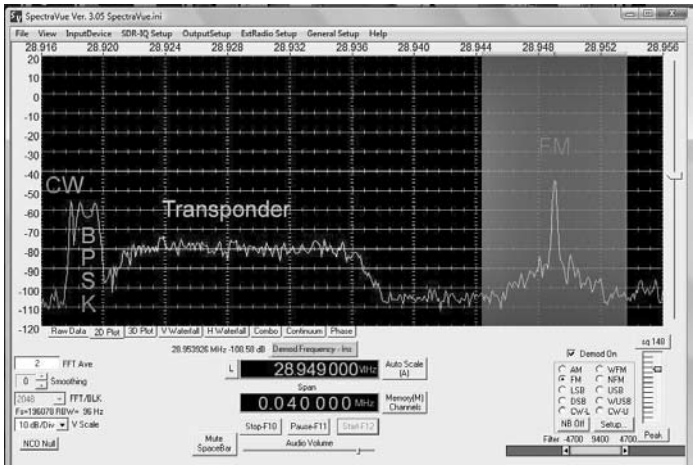


Figure 3. ARRISat-1 on board the ISS before being released into space.

seems to indicate that a 12V DC 16 Ah supply can be accommodated which is very considerable for a small satellite.

It is further proposed that the outer rim of each panel is fitted with PCB tracks in the form of a coil. The fitted coils will have 4 main functions:

1. To generate additional power from the Earth's magnetic field.
2. To torque the satellite against the Earths magnetic field.
3. To give orientation data to resolve the attitude of the satellite.
4. To take additional unused power from the batteries and elevate the satellite into an ever increasing orbit thus extending its usefulness and life.

The iconic Goonhilly Satellite Earth Station on Cornwall's Lizard Peninsula might once again be set to play a "starring" role at the forefront of technology. The former BT Satellite Earth Station is now set to be upgraded and re-developed by a consortium, Goonhilly Earth Station Limited (GES), for use at the forefront of world leading Radio Astronomy projects and Deep Space Network communications.

There are also plans to redevelop the Visitors Centre into an exciting new "Space" themed outreach centre. GES has worked closely with BT to develop the opportunity and a deal has been agreed, which includes GES taking a three-year lease on most of the Goonhilly antennas, including the four largest giant dishes, and an option to purchase the whole site for an undisclosed sum. BT will continue to occupy parts of the site. It will retain possession of some of the operational buildings, use of some of the smaller satellite dishes, and will continue to employ about 50 people engaged in research, testing and other operations. Apparently GES is planning to develop a number of replaceable "cartridges" that can be quickly installed at the dish focal point. They believe that it would be possible for one of these to be an "amateur radio" cartridge suitable for both transmitting and receiving. This would obviously be a tremendous asset for satellite and EME work at VHF, UHF and microwave frequencies in the future.

References

Southgate ARC website, AMSAT, and various satellite project web sites.
Please send me any news, feedback, requests, questions, hints, ideas, construction projects, interesting new purchases or whatever. I always need updates on the local activity,
<zl3dw@nzart.org.nz>

73, *Andrew ZL3DW*

WANTED: copy for *Break-In*

My stock of articles etc for future issues is running low so I appeal to members to assist with material for publication. This could be short or long articles on any topic related to amateur radio and electronics, constructional articles, book reviews, equipment reviews, software reviews, branch activity reports, etc.

I should also like to receive articles on electronics related topics such as auto-electronics, home sound systems, workshop practice; in fact anything that hams might find of interest. Thanks and 73, *John R L Walker ZL3IB (Editor)*
Email <zl2tw@nzart.org.nz>

Old Timers' Club

Roy Symon ZL2KH
<zl2kh@xtra.co.nz>

Secretary/Treasurer:
Roy Symon, ZL2KH
Mail:
25 Annandale St,
New Plymouth
Phone:
06-758-2156
E-mail:
<zl2kh@xtra.co.nz>
Monday evening SSB Net:
Net details: 2030 hr (local time) each Monday – on 3.870 MHz LSB.

New members

There is one new member to welcome this month. He is:

- 1285, ZL2TCA John Poulsen, Palmerston North.

John has been regularly checking in to our Monday night net and, along with Joe ZL2JM, is working on building VFO's for Codan transceivers.

Silent Keys

There are, sadly, four members to farewell this month. They are:

- 900, ZL2NN, Jamie Pye, Upper Hutt
- 862, ZL3OE, Dave Richards, Christchurch
- 758, ZL1SZ, Murray Evans, Whakatane
- 1128, ZL1AKY, Geoff Reed, Papakura

Sympathy is extended to all their families and friends.

Certificates sent out

Three members have been on the air for sixty years and have received their certificates:

60 Year Certificates:

- 1280, ZL2AVL Bill Luscombe, Waiouru
- 705, ZL1JT John Turnwald, Auckland
- 651, Gordon Vendt Stokes Valley

Congratulations on a great effort.

Request for QSL:

I am passing on a request for an old QSL card:

A special request; the following request has come from the son of a silent key. Hopefully someone in New Zealand will be able to help, if so please contact Dave directly.

"My father was an avid HAM operator in the late 40's and 50's. We lived on Waiheke Island in Auckland until he was drowned in a boating accident in 1957. His call-sign was ZL1MG. I remember he had a lot of call cards from other operators and he sent out a few as well. I was wondering if any of your members would happen to have one of his original cards and be willing to send me a copy or be willing to sell it."

David Parkin
T (home) 09 5253923
T (work) 09 3014471
E (home) <d.parkin@xtra.co.nz>
E (work) <dave.parkin@gen-i.co.nz>

Q Code For OTC Members:

Eion Gibson, ZL3AG, has been doing some thinking and has come up with the following Q Codes which could be appropriate for OTC members:

QAR: Is your arthritis acting up today? My arthritis is acting up today.
QBP: How many bypasses (or stents) do you have? I have ___ bypasses (or stents).
QDF: Does (or did) your ICD (implantable cardioverter-defibrillator) zap you when you key down? My ICD zaps (zapped) me when I key down.
QDN: Are you wearing dentures? I am wearing dentures.
QGC: How many grandchildren do you have (or do you have a new grandchild)? I have ___ grandchildren (or I have a new grandchild).
QGM: Are you operating golf cart mobile? I am operating golf cart mobile.
QID: What kind of incontinent diapers do you use? I use ___ diapers for incontinence.
QJR: How many joint replacements have you had? I have had ___ joint replacements.
QLO: Do you know what LOL (or IMHO, ROFL, etc.) stands for? ___ .
QLW: Do you watch Lawrence Welk reruns? I watch Lawrence Welk reruns.
QMD: Who is your geriatric physician? My geriatric physician is ___ .
QOT: Are you an Old Timer and were you licensed before no-code licensing? I am an Old Timer and I was licensed before no-code licensing.
QPA: What is your PSA level (or have you had your PSA level checked)? My PSA level is ___ .
QPG: Was that QRM or did you just pass gas? No, that was QRM.
QPJ: Do you drink prune juice? I drink prune juice.
QPM: Did you just pull a muscle? I think I just pulled a muscle.
QRX: What medications are you taking?
QSS: Have you received your social security cheque? I have received my social security cheque.
QVC: Do you know how to program your VCR? I can program my VCR.
QALZ: do you have Alzheimer's? I have Alzheimer's.
QGR: are you a grumpy old sod. I am a grumpy old sod.
QGT: do you have gout. I have gout.
QRTM: do you need a break to take your medication. I need a break to take my medication.
QTW: Do you know anyone that will climb my tower/tree?
QPH: Do your piles hurt today?
QVL: Do you use Viagra or Levitra?
QPC: Are you suffering Plasma Crud. I am suffering Plasma Crud.
QSN: Have you got a stock-broker in Nigeria .... I have a stock-broker in Nigeria.
QPFI: Penicillin fixed it.
QRTI: please wait while I put my teeth in.
QSD: senile dementia, I think my call-sign is...
QBM: A little Quick Bowel Motion today..
QCH: Do you have your call-sign on your hat?
QHF: I have just had a hot flush!

Thanks Eion; I am grateful for these because I had run out of copy for this page.

Roy Symon ZL2KH
OTC Scribe

NZART Stolen Equipment Register

NZART Council has decided to discontinue the Stolen Equipment Register, effective immediately. All equipment which is stolen should be reported to your local Police Station.

SPAM – Society For The Preservation Of Amplitude Modulation

Roy Symon ZL2KH
<zl2kh@xtra.co.nz>

Secretary/Treasurer:
Roy Symon, ZL2KH
Mail:
25 Annandale St,
New Plymouth 4310.
Phone:
06-758-2156
E-mail:
<zl2kh@xtra.co.nz>
Librarian:
John Nicholson, ZL1AUB
E-mail:
<j.nicholson@clear.net.nz>
Nets:
3.850 MHz (AM) Friday nights at 2000 hr local time.

I have received no copy for this month, so all I have is one new member and two silent keys.

New member

- 314, ZL2THO Jeff Howe, Wanganui

Silent keys

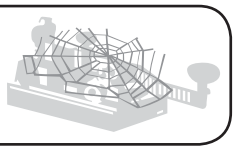
- 137, ZL2NN, Jamie Pye Upper Hutt
- 7, ZL1AKY, Geoff Reed Papakura

A hearty welcome to Jeff, and farewell to Jamie and Geoff. Jamie was a real stalwart of NZART and his obituary appears elsewhere. Geoff was controller of the Friday night AM net for many years.

Roy Symon, ZL2KH
Secretary / Treasurer,
SPAM (NZ)

Silent Keys

The Association deeply regrets to record the death of the following members and extends its sympathy to the bereaved.



Silent Keys: guidelines to contributors

Contributors are requested to limit their obituaries to between 200-400 words. Content should focus mainly on the amateur radio activities of the deceased. Normally photographs cannot be included.

Russell Blair ZL2AUZ

Russell Blair ZL2AUZ passed away on July 29, 2010 at Arohanui Hospice Palmerston North after a short illness. Russell was born in Perth 1916. He passed his license in December 1935 and his first call-sign was ZL1IB.

Returning to NZ 1940 – 1952 he taught in Christchurch at Papanui Central School and also completed a BSc degree at Canterbury University. His call-sign in Christchurch was ZL3BL.

He married Ruth in 1954 and the family moved to Palmerston North in 1956. Russell taught science at Longburn College at the same time establishing a radio business, 'Rexels Ltd' which specialised in installation and maintenance of 'HighFidelity' sound systems. Russell then went on to teach sciences at Palmerston North Boys' High School for 20 years.

In his retirement he kept busy importing, distributing and installing satellite equipment for 'free to air' TV viewers stations and rebroadcasting 3ABN radio from his home. Very fit and agile for his age, he climbed up ladders and on roofs installing satellite dishes till he was 93. He was always keen to learn and to help others. His wife predeceased him in 1988 and he has two daughters and two sons.

Meryl Strawbridge(daughter)

Neil Bradman Lewis Sturmey ZL1BF 1931–2011

Neil was an electrician and radio technician who served in the RNZAF in WW2 and then worked with Industrial Electronics Ltd and David Reid Electronics. He was involved with the first non-P&T Dept VHF radio systems. On retirement he turned to Amateur Radio as a hobby. First licensed as ZL1NBS in 1997 he changed to ZL1BF in 2001. Active in Branch 29 until failing health forced retrenchment around 2006, Neil was often seen at working bees, field days and AREC exercises. Latterly confined to his house, Neil met a sad end, alone and unattended. No family could be contacted in time for his funeral, nor since. All we can do is regret his passing from those who knew him.

Alan, ZL1AUW
Branch 29

Ross William Reddell ZL1VRR 1945 – 2011

Ross worked for Otis Elevators as an electrician for 20+ years, and then changed to working mainly on printing machines for approx ten years. In 1971 Ross and Betti joined a team of Pukekohe Timekeepers who began as Timing Marshals for International and other Car Rallies in New Zealand and they were involved in this for over 30 years. During this time (approx 1993) Ross gained his Amateur Radio license (ZL1VRR) and rather than have to give car rallying away completely they changed tack and became a 5km radio team right up until his final rally, just days before he went into hospital. Since becoming licensed Ross joined the Western Suburbs Radio Club based in New Lynn and he soon became involved as the secretary for a short time and was the Deputy President and AREC Section Leader at the time of his death. He also was a member of Papakura Branch and a keen participant at inter-branch bowling competitions as well as continuous activity in contests and club nets.

When Ross was called up for Compulsory Military Training at age 17 he had to admit that he was a diabetic; then about ten years ago he suffered kidney failure and had to go onto dialysis. In 2003 he saw an advert from Auckland Hospital resulting in him joining the team of Blue Coats as he felt it was a way of repaying the Hospital for all the treatment he received.

They purchased a small motor home so that they could accommodate Ross's need to dialyse four times a day when away on Rallies and other radio events including horse endurance events where he often organised the necessary team of operators located around the course.

As a member of Western Suburbs Radio Club, Branch 03, Ross was always found willing to take on various roles that were often hard to fill, and as Section Leader of the AREC Group the group was able to continue despite the falling numbers of members able to maintain their continuing contribution. A stalwart member of Branch 03 he will be sadly missed by all members.

Merv Thomas ZL1SK

Tony Allan ZL2DOG

Tony joined the Marlborough Br 22 in 2004 to attend radio classes. After three or four lessons Tony arrived one evening with the news that he had sat and passed the exam but decided to continue with the classes anyway.

Tony trained as a fitter-welder in Timaru and while working at the port he became a commercial diver. Tony went on to work at the Maui offshore natural gas project in the early 1970s when he became a saturation diver.

Thirty two years ago while in Taiwan working, Tony met and married Lu. They soon shifted to Singapore when Tony stopped diving. They came to New Zealand to semi-retire and decided on Blenheim, and Tony returned to his roots, working as a maintenance engineer at the Lake Grassmere Salt Works.

Soon after joining Branch 22 Tony served as secretary and was on the committee up until his recent illness. Tony greatly enjoyed his new hobby and in addition to being involved with club events he also experimented with digital modes on HF, and enjoyed regular local skeds on 2m SSB. Astronomy was another of Tony's interests; he enjoyed the cleaner atmospheric conditions of New Zealand compared to Singapore.

The highlight of Tony's amateur calendar was the Branch 22 trip out to Cape Campbell for the International Lighthouse weekend; a very social occasion and soon after the sun rose above the yard arm the firewater would be broken out by Tony. The most recent trip we made had been booked by him, but due to his final illness he was unable to attend.

Earlier this year Tony was diagnosed with cancer and went to Dunedin for fairly lengthy chemo and radiotherapy but unfortunately he developed complications and died after transfer to the intensive care unit at Auckland hospital on 1 September.

Tony's cheerful rat-bag qualities and his usual greeting: "whadaya reckon young fella" will be missed by us all in branch 22 and beyond. The thoughts of all of us are with his wife Lu.

Stuart Watchman ZL2TW

Geoff Reed ZL1AKY

To Celia (ZL1ALK) and members of the family, condolences from me and the members of various radio clubs and groups to which Geoff belonged.

Geoff gained his radio licence in 1952 and joined the Franklin Radio club in Pukekohe. In 1960 Geoff and a few other Papakura radio enthusiasts formed the inaugural Papakura Radio Club(branch 65 of NZART). Geoff did his time in the club as Treasurer, Secretary and President. The club enjoyed its 50th celebration in February this year, really pushed along by Geoff.

In the very early days Geoff, along with a few other members, would participate in various field day contests setting up in places like Hunua, Ponga and Karaka; he did this almost every year until about three years ago.

Later he participated in the frequency measuring contest, for which he had a passion and drove other members to participate in mobile rallies, transmitter hunts , county hunters awards and small local contests. Over the last few years Geoff attended the club's day time meetings setup for the retired club members and these were a great success.

For a long time Geoff conducted radio classes and many past and present club members will thank Geoff for the time and patience's taken to get them through their licence exam. Geoff was also a mentor to many club members, fixing broken radios, going to their homes and helping erect and tune aerials, helping them to get on the air and establish their first radio contacts.

Over the last couple of years,

Geoff had taken over checking the clubrooms after a hire and cleaning up areas. He had also become an expert at driving the floor polisher; no mean feat, he only took out one door frame that I was aware of.

Geoff loved junk sales, a time to trade in and out of old radio parts and gear. Geoff had a great display of vintage radios, taking the time to get them all in working order.

Geoff's passing is a great shock to us all since he always looked to be in good health and had been at the radio club as normal, the night before his fall in health. He will be greatly missed by us all.

Richard Gamble ZL1BNQ

Donal Morrison Reid ZL1AIF
1936 - 2011

It is with regret I advise the passing of a very dedicated and hard working member of Branch 51 EBOP in late July. Donal was our long serving Secretary and also Newsletter Editor for many years, both positions he was forced to give up in recent times due to ill health.

Born in the Bay of Plenty, his career and working life was that of a farmer. In his spare time and as a means of improving his knowledge and skill with the Japanese language, he studied for and gained his Restricted Amateur Radio License in August 1983. Initially issued with the call-sign ZL1UMG he persevered with the Morse Code (an obstacle for many a Ham) and eventually obtained his full license and call-sign ZL1AIF. This gave him the opportunity to make many contacts and life long friends throughout Japan where he made frequent visits.

Donal mentioned, on several occasions, that his involvement with Amateur Radio gave him the opportunity to become fluent in the language and with this knowledge and positions he held in the Rotary organisation led towards the establishment of a 'sister city relationship' between Whakatane in the Eastern Bay of Plenty and Kamagaya, a suburb of Tokoyo in Japan. He also sponsored and accommodated many young Japanese teenagers looking for work experience in another country and who had an interest in taking up farming as a career on their return to Japan.

Bevan Schwass ZL1MJ
Secretary, EBOP Branch51

QSL Bureau

by Barry Stewart ZL2RR
<zl2rr@xtra.co.nz>

Greetings from Wanganui! First-up this month the bad news item!

Two years ago, the New Zealand Post Office announced major increases in postage costs for their International Economy Mail Service. This increased amounted to 20%, a substantial cost burden to the Bureau operations as mailing overseas is its major expense each year. The Bureau has been very fortunate in that, through the generous donations of several of its users, the increase to the Bureau balance sheet was off-set somewhat.

Now, two years on, the Bureau costs are taking another hit! In the weeks leading up to October the following news item was recorded in the media:

'The days of sending a letter across the world by ship is coming to a close, with New Zealand Post set to halt its international economy letter service in October. New Zealand Post spokesman Michael Tull said the way people communicated had changed and the volume of letters being sent using the service were too low for it to remain economically viable.'

"Just like the 'Pony Express', the days of sending letters by ship were over; three weeks was too long for people to wait for delivery in the internet age", he said. The service will finish on 1 October.

This action by the Post Office has increased by approximately 16% the cost of postage of the Bureau's standard envelope unit. In this time of constraints on our Association spending, any major upward shift in overall Bureau costs resulting from the actions of the New Zealand Post Office is sure to put this members' service under the Council's microscope.

So, to put it bluntly, keep those cards and, especially if you are a major user of the QSL Service, donations rolling in to help keep this 'no extra charge to members' service viable!

I find the comments about "ships too slow" attributed to the Post Office spokesman a little disingenuous when compared to my recollections of what the 'Economy' Mail Service was about when introduced. Mail being sent by ships to overseas ports was not part of the general conditions of the service. Surface Air Lift was the deal!

The International Surface Air Lift service is a bulk mailing system that provides fast, economical international delivery of first-class mail international items. The price is lower than for first-class mail international service. ISAL shipments are flown to the foreign destinations and entered into that country's surface or non-priority mail system for delivery.

Looking back at 1991, which was the first full-year of operations under my management, the QSL Bureau operating costs were $1401.52 with a net cost of $1311.27 to NZART (2010–$1106.00). The same year, the Bureau handled 108 446 QSL cards from overseas (2010 – 33 000) and posted overseas 79 000 QSL cards (2010 – 23 000).

Back then, Global Surface mail cost 65c for a 200g x 20 mm thick envelope. These days the weight regime is the same but only if you can squeeze it into a 10mm thick envelope; and now $2.90 to post!

When I was appointed NZART QSL Bureau Manager in July 1991, there was a correspondence war over recent increases for small packet postage between NZART and the Commerce Commission and the New Zealand Post Office. A little study of the PO postage options soon produced the answer: Small envelopes were the way to go. This course of action provided overnight savings as well as giving members a far better service: a steady flow of postings overseas replaced the previous small packet 'sit around in pigeon-holes for many months to make the weight regime. Cards were dispatched several times a year to many countries instead of as previously lying about in the Bureau for up to 12 months. 1990 Bureau costings were overall $2472.00 with a net cost of $2156.00. QSL cards handled that year were: from DX 116 000 and from ZL 102 000.

After a flurry of incoming DX cards to the Central Bureau between April and June, things have slowed down somewhat; hence a lack of postings to members from the ZL-Prefix QSL sub-bureaux in recent times.

Since my last report in the May issue of *Break-In*, I have dispatched 5 kg parcels of QSL cards to the following Sub-Bureaux: ZL1 (May, June and August) ZL2 (May and July) and 700g envelopes to ZL3 (2 during May, 2 June and 2 July) ZL4 (2 during May, 1 June and 1 July).

A valuable suggestion from one of our bureau volunteers: "It would make life easier for me if people would only use prepaid envelopes or Kiwi Stamps on their envelopes, as this avoids the need to check postage after yet another increase by our wonderful New Zealand Post."

As I type this, it is nearing daylight saving time and no doubt some QSL cards will start arriving using this time (NZDT) for the QSOs logged. It is strongly recommended to stay with UTC/GMT so as your log details will match those of the station worked overseas. This should greatly increase your chance of getting a QSL Card in return. Also, please remember to maintain UTC on your shack clock so as to keep 'correct time' (and date!) for your log entries.

Recent QSL Bureau changes include ZA: Albania (23-08-2011) closed and TA: Cote d'Ivoire (23-08-2011) also closed. Since the year 2000, nineteen National QSL Bureaux have closed with just four new ones being opened.

To conclude this column, I thank all those members who have kindly enclosed a donation with their QSL cards over the past few months. The Association is most appreciative of your generosity, especially at this time of rising postal costs: this month's only 'good news' it would seem!

Please remember that if you have any questions, queries (QSL Managers/addresses etc) or comments, please feel free to contact me either via mail (1 Caversham Road, or Box 857, Wanganui), or Email <ZL2RR@xtra.co.nz>

73, *Barry ZL2RR*

REMEMBER:
Leave a three second pause between overs when using repeaters. Someone else may have an urgent message.

Around the Branches

RadioTek–A day of radio technology

By Kelvin Barnsdale ZL3KB

Another RadioTek day was held at the Christchurch Branch05 clubrooms, bringing a fresh intake of students into the world of amateur radio.

Six first timers and two second timers were booked in, so these students made the AM tuner and speaker amplifier respectively. We also had three third timers, and these were used as guinea pigs to try our new FM receiver adapter for the ongoing radio project. All went well, but we felt the increased pressure from overseeing a more complex project. Typical of VHF receivers, the board contains many different values of capacitors and resistor, and we had a high chance of a mix up. Also, since the PCBs were handmade ,they were more difficult for inexperienced constructors to solder. We have plans to get the PCBs made professionally next time.

The snow arrived in the afternoon, and the young students became optimistic for future school closures. Luckily the white stuff was not heavy enough to prevent homeward journeys at the end of the day, but it did curtail the usual antenna raising activities in the park. They will have to harden up for field day!

At the end of RadioTek day, we had eleven very happy students, and parents, going home with fully working projects. The team would like to congratulate itself; Rory ZL3HB, Graeme ZL3GSL, Brian ZL2BAT, Des ZL3AK, David ZL2ARY, Barry ZL3BMW, Aidan ZL3APB, Ron ZL3RON and Kelvin ZL3KB

The next RadioTek day is scheduled on 13th November this year, so if you want to help us spread the word, the booking contact details for these are Rory Deans 03 3254181 or <roryl@xtra.co.nz> with a website at <http://www.radiotek.org.nz/>

Michelle and Rodolphe at RadioTek.

Thomas and Calvin at RadioTek.

Young Amateurs at Christchurch Br05

My journey for 50 contacts

by Oliver Jenks ZL3ODJ

On 15 February 2011 at the Branch 05 clubrooms I went with my dad and a couple of hams to begin learning about the wondrous world of amateur radio. I obtained a CD with the exam generator to begin my journey for my call-sign.

The next week the devastating February earthquake struck and I did not go to radio club for several weeks, but I was fortunate to have the awesome teaching and guidance of Kelvin Barnsdale ZL3KB who helped me get my license within 2.5 months. With the exam generator my practice marks were increasing until I got into the 50s and I got my highest mark 58 out of 60 then I went to take my exam.

When I got my license and call-sign I began trying to get 50 contacts. I used a Yaesu FT80C which was gifted to me by a friend Jack Oliver ZL3WM to gain my 50 contacts. My first contact was my friend Aidan ZL3APB. ZL3APB also lent me his hand-held radio to allow me to gain

ZL3ODJ

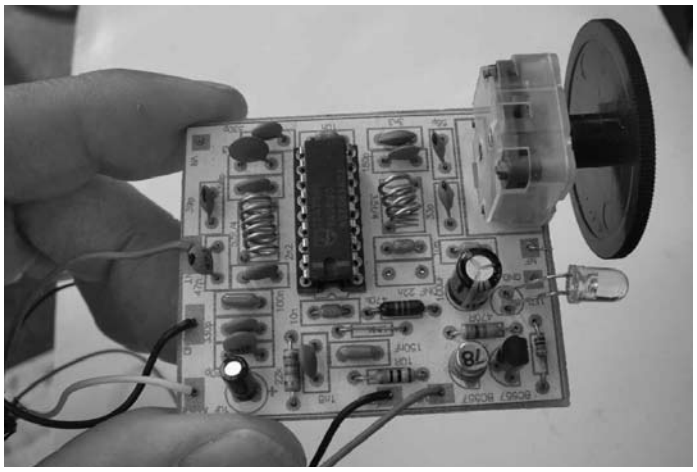
contacts with fellow hams.

I would like to give special thanks to Bob ZL3ADH and Jack ZL3WM and their group of friends who waited in line to give me contacts. I would also like to thank the Australian hams who gave me 12 contacts and all waited to give me a contact among my Australian pile up.

Also 'thank you' to my dad (ZL2ARY) who helped me get my license and who drove me to radio club every Tuesday night through the damaged streets of Christchurch's Avonside.

Thanks you all.

73s, *Oliver ZL3ODJ*



FM receiver board.

MEMO to *Break-In* contributors: CDs

Nowadays many contributors are sending me graphics and photos, etc on CD and this is much appreciated. At present the cost of a CD is less than the postage costs so, unless requested otherwise, they will not be returned. Please let me know asap if I still have a CD or photo that you would like returned and I will action. Thanks, *John ZL3IB Editor*

Answers to Crossword #13 (p 23)

Across (1) sensitivity, (7) Doubtful Sound, (8) boredom, (9) Tonto, (12) LAX, (14) dipole, (15) ET, (16) St, (18) heats, (19) rotator, (22) lake, (23) on, (24) tempt, (25) operating desk.

Down (1) sidebands, (2) neutral, (3) teflon, (4) volt, (5) troposphere, (6) radio, (10) teletypes, (11) OD, (13) amateur, (15) extort, (17) tramp, (20) OK, (21) ON, (24) tag.

DX Downunder

Graeme Hunt ZL1ANH and ZL1T
<graemeh@xtra.co.nz>

There has been some excellent DX over the past few months.

Operators at South Sudan ST0R gave us an opportunity to work a brand new country when the country of Sudan divided politically in July. Most of the 38 ZLs who made contacts used 20m with some making it on 15m. Thirteen ST0R operators stayed on the job for many weeks, which meant that it became easier to work them from down-under after the hordes of Europeans, Japanese and US operators got them in their logs. On 20m SSB they had unusually large splits, TX on 14145, listening 14200-14210. Seemed to work OK and maybe reduced the deliberate QRM. In all, ST0R had 121 286 contacts; only 138 were with ZL.

Lord Howe Island is midway between the east coast of Australia and Norfolk Island and the large operation in July and August by the VK9HR group was a magnet to many ZLs, with over 100 making a contact. Wes ZL3TE managed to work them on 21 occasions.

Ascension Island ZD8D in the South Atlantic was more difficult with only four ZLs making the grade; three of those on 80m CW. Look for ZD8Z early next year. The JX5O operation from Jan Mayen was also hard to work with only three ZLs making the grade. Gary ZL2iFB managed to work them on three different modes.

Benin TY1KS was on in August, and Bruce ZL1AAO activated South Cooks as E51AAO. The Arabian net on Fridays at 0500z at 14250 kHz is worth the occasional visit.

Band fillers

Observant readers may be wondering why on earth someone would want to work the same DX 21 times, or even twice. Remember these contacts are only an exchange of signal reports; always 59 or 5NN, and an acknowledgement of correct call-sign. In addition to the satisfaction and enjoyment that goes with all DX contacts, various awards require different mode contacts on different bands. So ZL3TE contacted the Lord Howe station using CW, SSB and digital modes on 8 different bands; what happened to 12m, Wes?

In my case I'm chasing 5 Band DXCC; 100 different countries on five different bands and the LOTW Challenge, the goal here is to work at least 1000 stations in different countries, on different bands and with different modes; so 21 contacts with VK9HR leaves Wes with only another 979 to go. With extremely rare DX I also try to work them more than once, even on the same mode/band. Then I have a backup if I get the dreaded "Sorry, you are not in our log". Many DXpeditions now run an online log; they upload the logs daily, and you can see if you are in it, saves the need to work them a second time on the same band/mode. To see an on-line log visit <http://<www.DXfriends.com/SouthernSudan2011/log.php> type in ZL1ANH to see how it works.

Digital ARRL have recently announced that their awards which were called RTTY have been renamed as digital awards so the inclusion of other modes like PSK31 and JT65 is recognised.

LOTW; for those that have never used Logbook of the World, I recommend it. It's run by ARRL, visit <www.arrl.org/logbook-of-the-world> for details. See figure 2 for an example from my LOTW log. While you can manually upload QSOs to LOTW, it's very cumbersome. In fact, if you are not keeping a computer log don't bother.

Figure 1. South Sudan team.

There are some simple steps to participate.

1. Register
2. Receive an encrypted signature to be stored on your computer.
3. Receive a password so you can access your LOTW account via the web.
4. Attach the encrypted signature to your computer log file.
5. Send your log file with its encrypted signature to LOTW.
6. Repeat steps 4 and 5 whenever you have enough new log entries.

LOTW does the rest, matches logs you've sent to other logs received, shows new countries/modes/band you have matched (confirmed) and works out awards. All this without a QSL card, envelope, stamp or International Reply coupon. It is run in conjunction with ARRL's DXCC program and on request, includes QSLs confirmed by card.

The VK9HR team was uploading their logs to LOTW daily so I was getting bands/modes confirmed within a few hours rather than waiting weeks or months; or not getting a QSL at all.

Backups. Do you log only on your computer? Have you thought about your log if your computer goes AWOL for any reason? I back mine up regularly to a memory stick, and I also email it now and again to a friend who saves it on his computer. If you are using Log Book of the World that's another

continued on page 34

Details							
ZL50GH	PJ4A	2011-05-28 06:52	40M	CW	7017	BONAIRE	
ZL50GH	RW3XW	2011-02-14 06:46	20M	SSB	14.204	EU RUSSIA	
ZL50GH	DU1/JJ5GMJ	2011-05-29 23:28	15M	CW	21.006	PHILIPPINES	CW
ZL50GH	N6QQ	2011-05-29 04:32	20M	CW	14.051	USA	
ZL50GH	TO8A	2011-05-28 03:07	20M	CW	14.029	MARTINIQUE	20M;Challenge
ZL50GH	NM5M	2011-05-28 03:00	15M	CW	21.007	USA	
ZL50GH	SP2IJ	2011-01-02 08:41	20M	SSB	14.192	POLAND	
ZL50GH	EA5HEU	2011-04-04 06:24	20M	SSB	14.225	SPAIN	
ZL50GH	KH6CW	2011-05-28 03:46	15M	CW	21.015	HAWAII	
ZL50GH	JH4UYB	2011-05-29 07:30	15M	CW	21.001	JAPAN	
ZL50GH	UA1AKE	2011-04-04 06:37	20M	SSB	14.225	EUROPEAN RUSSIA	
ZL50GH	S52UF	2011-05-17 04:14	20M	CW	14.006	SLOVENIA	
ZL50GH	ZL1BYZ	2011-05-29 03:36	20M	CW	14.041	NEW ZEALAND	
ZL1T	ED9M	2010-11-27 07:02	80M	CW	3.528	CEUTA & MELILLA	80M; Challenge; CW
ZL50GH	VE3EJ	2011-05-28 03:26	15M	CW	21.012	CANADA	

continued from page 33

back up, but I'm not aware if you can download your complete log from there. LOTW does allow you to search your LOTW log by call-sign, date etc so you can track QSOs via their website.

Propagation

Propagation is still mediocre with the SFI ranging around 100. The following paragraph about one of the many things affecting propagation from the ARRL contesting website makes interesting reading: "Equinox–the vernal (spring) and autumnal (fall) equinoxes are the days on which there are equal amounts of light and dark. Hams know them also as the days on which the grey line goes directly over the poles, making for some very long-haul DX QSOs! Contest season is ramping up and is considered to be in full swing after the autumnal edition." Equinox occurred on 20 March and 23 September this year.

Currently there are plenty of sunspots visible but we are not seeing the higher Solar Flux Indices (SFI) seen at the height of the previous cycles. SFI is a measure of solar flux at a frequency of 10.7cm and is observed by many labs throughout the world. Any effect the sun has on our ionosphere usually occurs about 72 hours after flares and sunspots are observed, as the solar wind travels at around 700 km/h.

Some astronomers are arguing that we are heading to another Maunder Minimum but generally there is consensus that we are not. You can review a major conference where all this was discussed at <www.shinecon.org>. Have a look at some of the abstracts from the conference.

If like me, you may find it all a bit much, so I've decided to just turn my radio on and see what happens. I'm writing this at the end of August and listening to the Faeroe Islands at 10am on 20m CW, fairly weak but apparently coming both long and short path, so you never know.

Q codes

To celebrate and update 100 years of the Q Code here are some further suggestions:

QZM I am Zimmer frame mobile; are you Zimmer frame mobile?

QCS I made a DX contact before it was spotted on the net: did you make the DX contact before it was spotted on the net?

DXpeditions,

Plenty to look forward to:

Afghanistan T6MO, for next 12 months. and T6FR November 2011
Belize V31NB, 16-27 December
Burundi 9U, look for HA3JB, now living there. 20m SSB and PSK31
Conway Reef 3D2CR, 1-6 October
Democratic Rep of Congo, 9Q6CC until November
Eastern Kiribati T32, 30 operators, October
Franz Josef Land R1I, two hams are wintering over until September 2012
Gambia C5, October/November
Ivory Coast TU2T, October-November
Palmyra and Jarvis Islands KH5, November/December
Malawi 7Q7HB, until 23 November
Malpelo HK0NA, Jan/Feb 2012
Namibia V5, December and January. Call-sign suffix will be op's home call.
Nepal 9N0MD, 13-25 November
Reunion FR/DJ7RJ, 4-25 October
Saba and St Eustatius PJ5, 20 October – 3 November
St Kitts V47JA, 10 October to 5 November
Tuvalu T2HA, October/November
Zambia 9J2RI, until 2012.

2m DXCC Congrats to Bob ZL3TY for the first Southern Hemisphere 2m DXCC, all except one are EME. Huge effort.

ZL special calls

Look for Paul ZL4PW operating as ZL4RUGBY during the Rugby World Cup.

Nets

ANZA Daily: DX net at 0515z on 14183 kHz and now also Saturdays 0445z on 21205 kHz. On Mondays, Fridays and Saturdays it is followed by the Pacific DX net on the same frequency from 0600z.

Arabian Net: Fridays only 0500z 14250 kHz, host JY5HX and often exotic Middle East calls.

Magazine Survey

Compiled by Grahame Fraser ZL3SJ
<grahame.fraser@canterbury.ac.nz>

Amateur Radio (WIA)

August 2011

p22 Foundation Corner 16–Test equipment: Home brewing revisited.
p24 Home brewing a mobile HF antenna.
p27 Building an 80 metre magnetic loop antenna for your attic (DIY capacitor, remotely controlled).

September 2011

p8 Build your own 200 watt 50 Ohm band-pass filters.
p30 The Simple SDR: a basic software defined radio anyone can build, Part 1.
p33 A simple and reliable tuning indicator for a 100 watt HF transmitter.

CQ

July 2011

p30 Advances in Remote Control without Computers (using Remote Radio Controllers over the Internet).
p52 Fishing for QSOs: Estimating Propagation.
p56 The SM-220 Revisted (up-dating the Kenwood SM-220 station accesory).
p71 Energy Savings for the Home, Shack, and Shop.

August 2011

p20 The 2011 Dayton Hamvention Safari, Part 1.
p38 A Striking Story: Lessons Learned from a Close Encounter with Lightning.
p44 Isolation (three methods, inductive, capacitive and optical, for digital and analogue circuits).

September 2011

p22 The 2011 Dayton Hamvention Safari, Part 2.
p52 Using the Inexpensive TB-250 Thrust Bearing with Low-Cost Rotators.
p56 Working with Plastic Homebrew Housings.

QST

August 2011

p30 A Modified MouseFET Low Power Transmitter (40m, 0-10W).
p34 A Suspended Quarter Wave 40 Meter Wire Vertical Monopole.
p37 VOSK – A Voice Operated Straight Key For Hands Free CW operation.
p40 The FSKit –A simple Sound Card Interface for Generating Radioteletype Frequency Shift Keying.
p43 Product Review: Ten-Tec Model 599AT Eagle HF and 6 Meter Transceiver.
p52 Getting on the Air: What Do Automatic Antenna Tuners Do For Us and How Do They Do It?
p54 Hands-On Radio #103: Detecting RF, Part 2.

RadCom

July 2011

p19 Homebrew: A noise source.
p26 Equipment Review: Ten-Tec Eagle HF & 50MHz transceiver.
p32 ATV Filters.

What's on the air now? <www.DXsummit.fi/DXSpots.aspx>
Announced operations: <www.ng3k.com/Misc/aDXo.html>
QSL information: <www.qrz.com>
Sunspots: <www.solarcycle24.com/>

Acknowledgements: ARRL DX, OPDX. Contact me at Call-Book address or by email at <graemeh@xtra.co.nz.>

Awards

Awards Manager: Alan Chapman ZL3GX
<awards@nzart.org.nz>

At the time of writing, I have not heard if the Rhododendron Award is running this year. The Powerco Taranaki Garden Spectacular, New Plymouth is running from 28 October till 6 November 2011. The rules for the award are in *Call-Book*.

Next year there is another Kordia National System Award in association with New Zealand Historic Places Trust, running from 1 January till 6 February 2012. The 2012 award is being run by the Hamilton Branch 12. Full details will be in *November/December Break-In* or at <http://zl1ux.tripod.com/nsaward.html>.

Kordia National System Award

A new network services agreement has been signed between Kordia Ltd and NZART. This gives amateurs continuing free access for amateur repeaters to eleven of Kordia's sites, and in return Kordia will be recognised as premium sponsor of amateur radio.

As our contribution to this new sponsorship agreement with Kordia, Wellington VHF Group have granted Kordia naming rights to the National System Award. It will be named the Kordia National System Award for five years, the duration of the new agreement.

Your committee was approached in March by ARTANZ to assist with the proposed sponsorship deal with Kordia. It was suggested that we grant the naming rights to the National System Award to add value to, and to be a positive influence on the outcome. We were happy to make this contribution to ensure continuation of site access for repeaters. The principle of granting naming rights was checked with MED and deemed to be acceptable by them.

The schedule of the site access is valued by Kordia at $89 200 (including GST) per annum, a total of approximately $446 000 over the five year term.

This is a very generous contribution to amateur radio by Kordia, and during the five year term we will work with them to foster a good and successful on-going relationship. The agreement with Kordia is renewable, providing a powerful precedent for further, extended site access for amateurs.

Please continue to give this award your support. In addition to providing a fun event for amateurs, it does emphasise the role and the performance of the national system. The new naming of Kordia National System Award rewards the most generous contribution to amateur radio by Kordia Ltd.

Dick Greenbank ZL2TGQ
Awards Custodian
Wellington VHF Group Inc

Club Awards

Clubs running short-term awards or new awards should send details of the award to me via email or at my *Call-Book* address or the address below. Remember that *Break-In* is only published on even months and copy, including, if possible, a copy of the certificate, for inclusion, should reach me by the end of the even month.

The Awards Net runs on 80m, 3.677 MHz every night from 0800 UTC every night of the year. Every one is welcome to join in especially if you are mobile and in a rare county or district.

NZART Awards Manager, PO Box 1733, Christchurch 8140 <awards@nzart.org.nz>, <www.nzart.org.nz/activities/awards/>

Next deadline for copy is **10 November**

p34 Antennas: Shorted turn tuning.
p39 Working motorcycle-mobile.
p42 Design Notes: Power supply protection and salvage.
p60 The ground mounted quarter wave vertical antenna (impedance measurements in 21MHz vertical, with 0–32 radials).
p65 PICaYAGI: An intelligent, self-tuning Yagi, Part 1.

Hamilton Amateur Radio Club
presents

Kordia National System Award 2012

in association with
New Zealand Historic Places Trust

The Kordia National System Award 2012–Historic Places, is presented by the Hamilton Amateur Radio Club, Branch 12, NZART, in association with the New Zealand Historic Places Trust. This is a fun award available to all amateurs to demonstrate the coverage and use of the National System, to promote our history and Category 2 Historic places.

All details for this award, are available at:
<http://zl1ux.tripod.com/nsaward.html>

The award will run from 1 January 2012 to 6 February 2012

Applications close: 6 March 2012 with The Award Custodian.
Hamilton Amateur Radio Club, PO Box 606, Hamilton 3240
Email to: <branch.12@nzart.org.nz> with KNS2012 in the subject line.

"DX" WITHOUT "TX"

For over 60 years, the NZRDXL has catered for the interests of DX listeners in New Zealand.

From Radio Bangui in the steamy jungles of Africa, to the haunting Andean music of Radio Huancayo, to the ever-accurate news from BBC, radio still delivers an important message.

And our monthly magazine The DX Times will tell you what's on the bands and where and when to find your DX-targets.

Whether you're a die-hard DXer, a news junkie, a stickie-beaker, or looking for an alternative to TV and the internet, you'll find people with common interests in the NZRDXL. All for as little as $20 per year.

For more information please visit www.radiodx.com where you can download a sample DX Times or request an info-pack from:
NZRDXL, PO Box 39-956, Howick, Manukau

August 2011

p18 Homebrew: More on noise; DDS local oscillators.
p24 PICaYAGI Part 2: the electronics.
p38 Design Notes: build your own sound card.
p42 Start Here: Making the most of sporadic-E.

Contests

Contest Manager: Frank Hunt ZL2BR
<zl2br@ihug.co.nz>

2010 Results ZL stations:

Category	Call	Score	Mults	Total	160m	80m	40m	20m	15m	10m
Ph SO All LP	ZL1AAO	134228	92	203	22	45	106	21	9	0
Ph SO All LP	ZM4M	83250	185	295	0	4	28	256	7	0
Ph SO All LP	ZL2MM	39200	70	127	2	25	38	45	16	1
Ph SO All LP	ZL3DXT	12960	40	73	0	7	45	15	4	2
Ph SO All LP	ZL1KNI	10290	35	71	0	7	40	24	0	0
Ph SO All LP	ZL1WAL	6734	26	42	0	13	24	1	4	0
Ph SO All LP	ZL2AYZ	6106	43	48	0	0	23	23	2	0
Ph SO All LP	ZL3GA	2850	30	36	0	1	12	21	2	0
Ph SO All LP	ZL1TPh	1638	21	24	0	0	13	9	2	0
Ph SO All HP	ZL1AIX	1047489	437	603	0	126	117	168	192	0
Ph SO All HP	ZL1AIH	434805	303	462	7	51	55	188	161	0
Ph SO All HP	ZL3NB	95164	148	234	0	15	66	143	10	0
Ph SO All HP	ZM2A	46718	94	152	0	17	44	75	16	0
Ph SO All HP	ZL1T	17712	72	92	0	8	19	59	6	0
Ph SO 160m HP	ZL4R	7200	12	30	30	0	0	0	0	0
Ph SO 80m HP	ZL4AD	96000	64	150	0	150	0	0	0	0
Ph SO 40m HP	ZL2UO	63050	97	130	0	0	130	0	0	0
Ph SO 40m HP	ZL1CKK	44550	81	110	0	0	110	0	0	0
Ph SO 20m LP	ZL3RCK	589	19	31	0	0	0	31	0	0
Ph SO 20m LP	ZL2SKY	280	14	20	0	0	0	20	0	0
Ph SO 20m HP	ZL1BYZ	148614	282	527	0	0	0	527	0	0
Ph M2	ZM4T	3294719	697	1485	17	94	360	381	633	0
Ph M1	ZL3M	174838	214	302	1	14	84	170	32	1
CW SO All LP	ZL1TM	1719025	665	1008	0	0	312	384	295	17
CW SO All LP	ZM4M	125325	225	336	0	3	21	202	110	0
CW SO All LP	ZL4NX	39562	151	194	0	0	1	132	58	3
CW SO All LP	ZL3REX	36883	77	102	1	28	20	27	26	0
CW SO All LP	ZL3IO	6592	32	42	0	0	40	0	0	2
CW SO All LP	ZL3GA	6405	35	46	0	5	22	15	4	0
CW SO All HP	ZM2B	1958385	605	993	0	0	502	271	204	16
CW SO 80m HP	ZL1AZE	552720	188	294	0	294	0	0	0	0
CW SO 40m HP	ZL3NB	634310	274	463	0	0	463	0	0	0
CW SO 40m HP	ZL3TE	488840	242	404	0	0	404	0	0	0
CW SO 20m HP	ZL1BYZ	277428	379	732	0	0	0	732	0	0
CW SO 10m HP	ZL2GQ	90	5	6	0	0	0	0	0	6
CW M2	ZM1A	7878650	1054	1842	14	223	731	466	380	28
CW M1	ZM4T	3624212	817	1342	3	87	450	373	404	25
CW M1	ZL2AGY	1232994	434	713	0	0	491	58	164	0

Oceania DX Contest

The 2011 Oceania DX Contests will be held over the following weekends:

Phone Contest: 08:00 UTC Saturday 1 October to 08:00 UTC Sunday 2 October 2011

CW Contest: 08:00 UTC Saturday 8 October to 08:00 UTC Sunday 9 October 2011

Log deadline: 7 November 2011.

Full rules and results can be found at: <www.oceaniadxcontest.com>

Results 2011 Memorial Contest

Wow, there were more VK than ZL callsigns in the logs! Check out this Activity Summary table:

Mode	*Calls*	*Logs*
ZL CW only	9	6
ZL SSB only	57	12
ZL CW & SSB	11	8
VK CW and/or SSB	77	4

Logs received were up on last year, but it sure is a pity that only 26 logs were received from the 77 ZL's that were active.

Some were unsure as to whether ZL50GH could be counted as a prefix multiplier. Well the answer is 'yes', as the rules say each different prefix, not call areas count as multipliers. Last year Tony ZL2AGY used the ZM2 prefix and that also counted as a different multiplier. However there could be a downside to using a unique prefix, as unfortunately Graeme ZL1ANH discovered, because everyone except him had the opportunity to work ZL50GH and score two extra prefix multipliers. It certainly looks like the two ZL50 multipliers helped Bill ZL2AYZ to pip Graeme and grab first spot in the Phone & CW section.

I disallowed a couple of unique multipliers, a LU7 and a N2, as both only appeared once in the logs received. The standard practice in contests is that a callsign should appear in at least five logs for the call-sign to count as a multiplier.

International HF Contest Calendar for October/November 2011

Oceania DX Phone Contest	Oct 1/2	0800 UTC Sat–0800 UTC Sun	<www.oceaniadxcontest.com>
Oceania DX CW Contest	Oct 8/9	0800 UTC Sat–0800 UTC Sun	<www.oceaniadxcontest.com>
JARTS RTTY Contest	Oct 15/16	0000 UTC Sat–2400 UTC Sun	<http://jarts.web.fc2.com/2011/rules2011.html>
Worked All Germany WAG) Contest (CW/SSB)	Oct 15/16	1500 UTC Sat–1500 UTC Sun	<www.darc.de/referate/dx/contest/wag/en/>
Ukrainian DX Contest (CW/SSB)	Nov 5/6	1200 UTC Sat–1200 UTC Sun	<www.ucc.zp.ua/urdxc2011rules_eng.htm>
WAE (Worked All Europe) RTTY Contest	Nov 12/13	1200 UTC Sat–1200 UTC Sun	<www.darc.de/referate/dx/contest/waedc/en/>
Bulgarian DX Contest (CW/SSB)	Nov 19/20	1200 UTC Sat–1200 UTC Sun	<http://lzdx.bfra.org/rulesen.html>
CQ WW DX CW Contest	Nov 26/27	0000 UTC Sat–2400 UTC Sun	<www.cq-amateur-radio.com/ cq_contests/index_cq_contests.html>

WARO – nz womens amateur radio operators

with Topsy ZL2LS, Sharon ZL2BQ and Ngaire ZL2UJT
<waro@nzart.org.nz>

Hi everyone. It's that time again, and I hope that you all kept warm during our freezing weather and snow storms in August, which affected most of New Zealand.

Here in Taranaki we had snow in areas we have never had it before and I'm sure most of you will also have experienced the same. It makes you pleased that we have a hobby that we can do indoors at times like these. We all felt for our girls in Christchurch as I know many of you were without power during this time, as if you haven't had enough problems. Hopefully by the time you read this things will have warmed up and we will be looking forward to warm spring weather.

Women's Radio is still going strong but we need to keep the enthusiasm going and encourage younger people to come and join us. Maybe if you have a few girls in your area you could arrange a café visit for morning tea now and again to keep up the contact. Club nights can be fun if you participate and our local club has had some great talks, practical evenings doing projects and a radio quiz which was fun and also helped us remember some of the questions and reasons for them when we did our exam. I know Topsy and Sharon have some great ideas coming up for their club night also.

Ngaire ZL2UJT

Call-sign	CW QSO	Phone QSO	CW prefixes	Phone prefixes	Score
Phone & CW (Memorial Trophy)					
ZL2AYZ	76	115	7	8	4005
ZL50GH @ ZL1ANH	70	130	5	9	3808
ZL1BGS	53	108	7	10	3638
ZL2AYB	63	117	6	8	3402
ZL2AUB	60	115	6	7	3055
ZL2AUA	42	88	6	8	2408
ZL2AQL	46	80	7	6	2236
ZL4IM	34	59	7	5	1524
CW Only (Auckland Shortwave Cup)					
ZL2AGY	94	6	1128		
ZL1BWG	78	6	936		
ZL1IE	72	7	798		
ZL2JU	53	5	550		
Phone Only (Phil Armstrong Memorial Plaque)					
ZL2TZE	202	10	2020		
ZL4RO @ ZL3UR	186	10	1860		
ZL1AAO	151	10	1510		
ZL2CQ	158	9	1422		
ZL4RMF	155	9	1395		
ZL4DE	137	9	1233		
ZL2ADP	104	8	832		
ZL2TNG	116	7	812		
ZL4HD	75	8	592		
ZL1JV	69	8	552		
Australian stations					
VK2ACD	178	10	1780		
VK4GH	104	9	936		
VK2FAJM	113	8	905		
VK4ATH	20	5	100		

Check logs received from ZL1ALZ, ZL2BR/ZL4BR & ZL3LC

YL International in Adelaide, Australia 2012

Please keep in mind this special meet in Adelaide. Web page: <http:www.ylinternational2012.com>.

WARO 50th Anniversary

Millenium Hotel Rotorua is booked for luncheon on 10 March 2012. Joline ZL1UJB still needs your profile for the Anniversary booklet. It only needs to be a few words with a photo and will make this so much better when everyone participates. Email <jolinebeale@paradise.net.nz> 07 884 8416.

Silent Key

- ***Geoff Read*** ZL1AKY, from Lynnette ZL1LL

Geoff was the OM of Celia ZL1ALK. Celia is a foundation member of WARO and Geoff supported her and the group at all times. Geoff was involved in amateur radio from teenage years and after their marriage nearly 55 years ago Celia gained her call-sign. He attended various get togethers, hosting many at their home in Papakura. Nine WARO members attended the service in Papakura along with many OMs whose lives Geoff has been involved with in Papakura and Franklin branches and as a tutor and examiner of new radio operators.

Powder Puff Contest

The annual Powder Puff Contest was held in the Auckland area on 14 August. The day was fine but very cold and windy. Our car was buffeted by the wind on the top of One Tree Hill but we had an excellent spot for making contacts since Tom was the mystery station. We were pleased to welcome two new contesters in their first contest; one having passed her examination only the week before. Six YLs took part and twelve OMs.

Winners were:

YLs

1st Marlene ZL1MYL

2nd equal Marion ZL1BLI and Rosemary ZL1RO

continued on page 38

Straight Key Night 2011

Polish and lubricate that old Morse key and enjoy an evening of old time radio fun. An activity night in which everyone can be a winner and receive a certificate to prove it.

When: 2000–2200 NZDT, (0700-0900 UTC), Sunday 6 November 2011; (two one-hour periods)

Band: 80m only.

Mode: CW sent with straight key i.e. characters formed manually, no system of automatic dots, dashes or spacing permitted.

Divisions: Vintage QRP, Vintage QRO, Open QRP, Open QRO.

Explanation: Vintage: Receiver and transmitter or transceiver using valves, no solid state devices in the signal line permitted. QRP: 5 W or less RF output.

Exchange: RST/QTH/operator's name (one word)/key used (e.g. ZC1, P&T)/TX type (eg ZC1, FT1000, homebrew)/TX power (watts). e.g. 599/Waimauku/Ken/PNT/ IC7800/100W.

For DX stations exchange is just RST/operators name/QTH.

Scoring: 1 point per QSO. Stations may only be worked once in each one hour period, CW to CW only. All stations submitting logs must use a straight key throughout, but straight key stations may QSO stations who are using bugs, electronic keyers or keyboards.

Score weighting multipliers: Multiply total points as follows: Vintage QRP x2, Open QRP x1.5, Vintage QRO x1.2, Open x1.

Logs: Each log QSO entry to show: Time (NZDT or UTC), callsign, RST, QTH, name, key type, Tx type, Tx power (of station worked).

Calculate total score, multiply to give total score claimed. Logs to have associated data sheet giving entrant's: name, call-sign, QTH, age (optional), full description of equipment used, ie. key, Tx/Rx, Tx power, antenna.

Send logs by November 30 to: Ken McCormack ZL1AIH, 181 Ararimu Valley Road, Waimauku, Auckland, or by e-mail to <zl1aih@xtra.co.nz>

All (including DX stations) who send a log will receive a certificate. Special certificates to top three in each division. Annotated certificates e.g. Best ZC1, Youngest/oldest op, etc., at manager's discretion.

continued from page 37

OMs
1st Ian ZL1AOX
2nd Gary ZL1WGL
3rd David ZL1DK.

Girl Guide Jamboree

A Girl Guide Jamboree is to be held in Rotorua on 14-20 January 2012. There has been a suggestion that WARO may be interested in organising an Amateur radio station. We would really appreciate hearing from anyone who would be interested in operating the station event for one day. We are hoping for a proficiency badge for the girls at conclusions of the Jamboree.

Please contact Margaret Bretherton ZL1MB <tedmarg@clear.net.nz> (07) 345 9687 for more information.

Peggy Jack ZL2PP; 90 years young and still enjoying Amateur Radio

Peggy was born in Christchurch in 1921; yes, that makes her 90 years old and, to look at Peggy, you would not think for a minute she was that age.

Peggy obtained her licence about 16 years ago (1985) with a 98% pass rate, when she lived in Picton. She then joined the Blenheim Branch 22 and became involved in helping with Civil Defence and also the Travellers' net, which was held over the holiday periods like Easter, Christmas to help visitors to the area find places to go etc.

Every morning while living in Picton, and after she had got her licence, Peggy would do a Morse session along with two other people, one of them was Frank Stretch ZL2AZE. Frank said that it was important for her to keep her skills up as she had to do Morse to get her licence, she wasn't too keen on doing it but she did but she is sure that she would not be able to do it now.

Peggy used to travel to Australia for extended summers; in another words, six months here and then over our winter she would go to the Sunshine Coast where she joined the Sunshine Coast Radio Club, and she still has contact with some of these club members today.

I asked Peggy why she sat her Radio Licence and her reply was "Because when I turn 100 years old I hope to be able to push the button

Peggy ZL2PP.

on the side of the radio and then be able to talk to someone, and you wouldn't be lonely as you would always have someone to talk to. Another reason was that all you had to do was remember how to choose between A, B, C and D and decide which the correct answer was, no other reason." Well, that has to be one of the better reasons for sitting your amateur licence.

Peggy has belonged to the following clubs, Blenheim Br 22, Sunshine Coast Australia and now Nelson Br 26. She had two call-signs at one stage; VK4CPP and her current call-sign ZL2PP.

Peggy used to do a lot of HF to communicate with her friends in the Sunshine Coast, but nowadays she uses Echo-link as she said that this has better reception and it is not as technical as HF and anything technical she touches always goes wrong. While living in the Sunshine Coast in Australia, Peggy used a 70 ft tower that could extend to 85 ft that her husband Peter built for her to use for HF communications. That sounds like an impressive tower that most guys would like in their backyard.

Peggy's hobbies besides Amateur Radio include photography, garden club, Probus club, the Morris Minor Club, and recently both she and her husband restored and donated an old Morris Minor car to the local Hospice to be raffled and the money raised to be donated to the Hospice. This thoughtful gesture raised a lot of money for the Nelson hospice.

Peggy used to do a lot of travelling and she mentioned that while living in Wanganui she used to take historical tours around Wanganui and she has even written a book about this.

Peggy stated that by joining Amateur radio it can bring you in touch with people from all over the world and with all the travel she has done, she has made some great friends through Amateur radio. She used to do the Coral Coast Radio net in Australia, and that used to be great she said, as if you wanted any information about Australia when travelling around the country, the Coral Coast Net would tell you all you wanted to know, right down to where the best pies in Australia were.

Peggy enjoys Amateur Radio and more so her weekly net with the girls from the Nelson Amateur Girls (NAG net), and she encourages all women to get involved with this hobby as it is a lot of fun and gives new friends to make.

Recently Peggy celebrated her 90th birthday with a group of the girls from the Nelson branch where we all went out to lunch and had birthday cake with all the trimmings and which she thoroughly enjoyed.

Peggy would love to see more women get involved with Amateur Radio and her main concern is what is going to happen to Amateur Radio in the future, with all the modern technology coming along, but as long as Amateur radio is still around for her to push that button when she is 100 she will be happy.

Peggy is a bright happy and very cheerful person, full of knowledge and it is a privilege to have been able to chat with her and to have her tell her story to us all. She is a very active member of Nelson Br 26 and we are honoured to have her in club and also in the girls' group that Branch 26 has.

Well done Peggy. I am sure that we and many others will all be calling you on your 100th birthday so you can push that button and talk to someone.

Topsy Scott ZL2LS &
Peggy ZL2PP

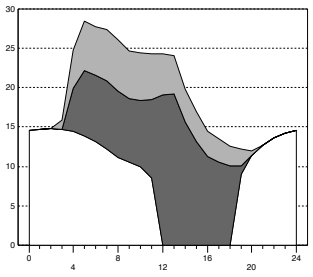
Motorhome Hams

In May 2011 we attended a Motorhome Rally at Hurangi School in Taranaki. As we drove over to the site we put a call out on the radio and was answered by ZL2ADU who mentioned he was on the way to a motorhome rally. By the time we had got settled two other Hams arrived. So out of 30 motorhomes there were five Hams. We had a great weekend discussing portable aerials and generally Radio much to the dismay of a couple of the wives who thought we were all mad. Peter brought along an antenna analyser which we ran over our aerials provoking much discussion and generally keeping us out of mischief. I can see why many of us YL's say"If you can't beat them join them", as it is so much more interesting when you have a hobby in common. To make it more difficult they parked Zl2APV, ZL2UJT and ZL2ADU next door to each other and ZL2QP and ZL2SZ next door so we all had to take turns to transmit.

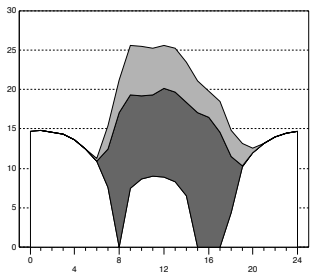
Taken in front of ZL2QP's motorhome complete with mobile Antenna. Front row (l>r) Chris YL of ZL2SZ, Ngaire ZL2UJT, Marion YL of ZL2QP (with granddaughter and Peter ZL2QP; back row Brad ZL2SZ, Graeme ZL2APV and Harry ZL2ADU.

Ionospheric Predictions

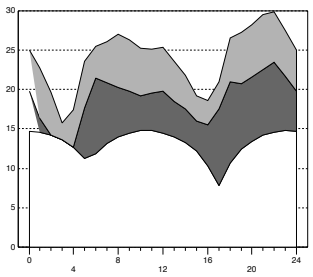
NOVEMBER / DECEMBER 2011 T-index = 72



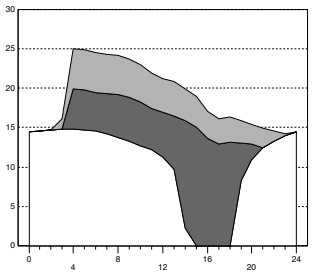
WN-
Moscow
(SP)
16548 km
312°



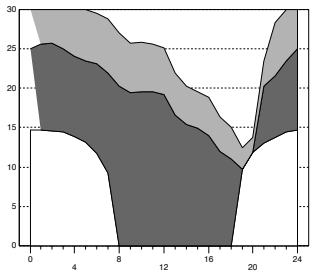
WN-
London
(SP)
18814 km
343°



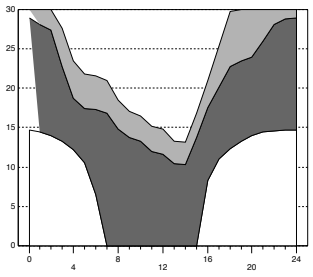
WN-
Jo'burg
(LP)
28265 km
31°



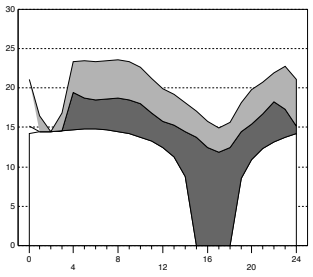
WN-
Istanbul
(SP)
17168 km
281°



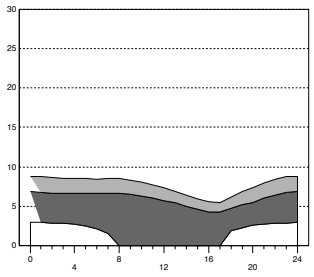
WN-
Tokyo
9274 km
332°



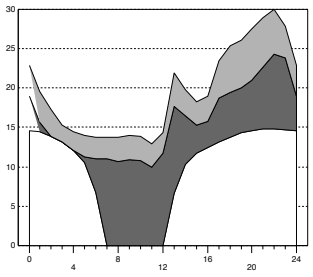
WN-
San
Francisco
10859 km
45°



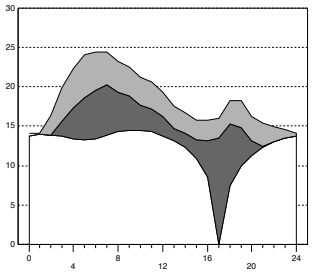
WN-
Cairo
16519 km
261°



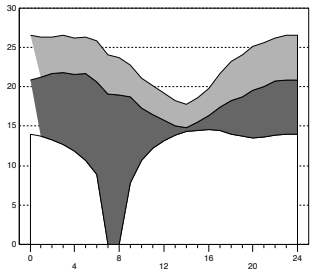
WN-
New
Zealand
300 km



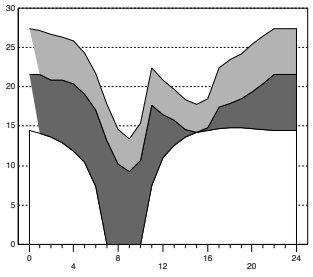
WN-
New
York
14402 km
66°



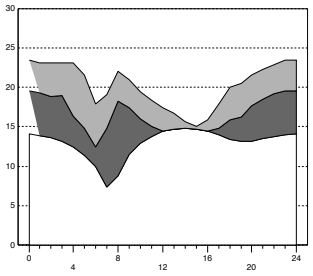
WN-
Jo'burg
(SP)
11759 km
211°



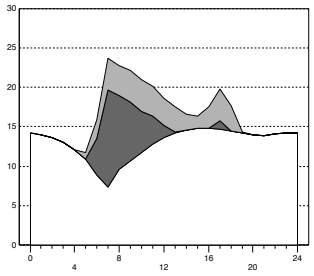
WN-
Rio de
Janeiro
11780 km
144°



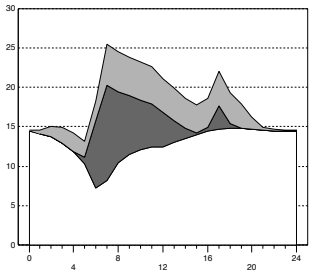
WN-
Barbados
13962 km
104°



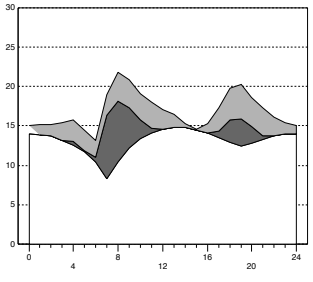
WN-
Dakar
16862 km
155°



WN-
Moscow
(LP)
23476 km
132°



WN-
Istanbul
(LP)
22856 km
101°



WN-
London
(LP)
21210 km
163°

Horizontal axis shows time in UTC.

Vertical axis shows frequency.

Propagation is possible in the shaded areas, with best operation in the darker area.

These predictions are based on solar activity data supplied by IPS Radio and Space Services.

See pages 6–9, Break-In May/June 2004 "Choosing the Best Frequency" by the late John Gabites ZL2AQ for interpretation of forecasts and explanation of terms MUF, OWF and ALF.

HAMADS

WANTED: Sony Model ICF-6800W Communications Receiver in good working order and condition. The 6800W is a 1960's model and has orange model printing on the front panel. Please contact Des Davey, 16 View Road, Te Kuiti 3910 or Ph (07) 878-7315.

WANTED: RADIO VALVES. Cash paid for old radio and TV valves. Prefer new in boxes. Ph (09) 575-6940 or E-mail <paul.ssegrub01@gmail.com>.

WANTED: Yaesu older 4-pin style microphone for FT-101ZD. Any model considered. ZL3TR. Ph (03) 388-7170 or *CallBook* address.

WANTED: by Branch 81, Wacom WP639 or equivalent 2-metre duplexer. Contact (Secretary) Gavin ZL1GWP. Ph (07) 8430326 or E-mail <branch.81@nzart.net>.

WANTED: FT-790RII All mode 70cm transceiver complete or just the 25w linear amplifier (FL-7025) for the above. Kevin ZL3DAC. Ph (03) 789-9875.

FOR SALE: Yaesu Quadra VL-1000 Amp. Excellent condition. Further details contact Ian Mosely ZL1IBM. Ph (09) 433-8456 or E-mail <jonhenry@ubernet.co.nz> or *CallBook* address.

FOR SALE: Yaesu FT60 2m/70cm Handheld. Boxed, with two Yaesu batteries. Excellent condition. Email for photo. $275 post free. Paul ZL4AX. Ph (021) 158-2521 or E-mail <zl4ax@yahoo.co.nz>.

FOR SALE: Icom IC-725 with AM unit – $450. Icom SM-14 Desk Mic – $45. Yaesu FC-700 ATU – $100. BHI Noise Suppression Speaker – $100. Shinwa Low Pass Filter – $15. Brian ZL2CT. Ph (06) 308-9992 or E-mail <zl2ct@xtra.co.nz> or *CallBook* address.

FOR SALE: ICOM IC-745 HF Transceiver with two keys and MJF Versa antenna Tuner MJF-941D – $350. HP Scope HP54600 100Mhz, HP Spectrum Analyzer HP8558 (0.1-1500 Mhz), two function generators – $400. ZL1DMB. Ph (021) 215-9016 or E-mail <derek_boshier@hotmail.com>.

FREE: Tiltover pipe mast! First come, first served! Mast is 10m high, and comes with base, welded hinge, fittingsand tapered mast. Mounting hardware and insulated guy wires included. Contact ZL1BPU QTHR or <zl1bpu@nzart.org.nz> for location details (Franklin area).

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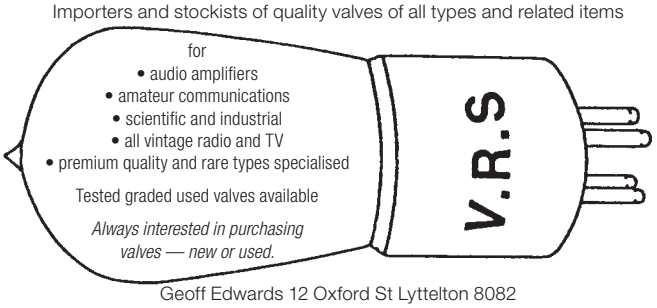
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Hamads and Classified Advertising in *Break-In*

Hamads up to 30 words are now free as a service to members but the following conditions will apply:

(1) Hamads. A single, free Hamad in each issue of *Break-In* is only available to financial members and Branches of NZART buying or selling personal equipment. Members and Branches wishing to use this service must include their NZART Membership Number or other evidence of membership. If possible they should use the official HAMAD form (on the reverse of their address sheet). If this is not convenient the advert may be emailed or sent typed double-spaced, but proof of current membership must be provided.

Each free Hamad is limited to 30 words; any extra words will be charged at the current rate of 25c per word, telephone and fax numbers count as two words each, e-mail addresses and *Call Book* address as three words each. All prices include GST. Free Hamads will also be accepted for sales of deceased estates where the member was a financial member of NZART during the past 12 months and from branches who are financial members of NZART (ie have a Membership No).

Advertisements are accepted in good faith from amateurs and may only be used be the sale of used radio and allied equipment. The Association, or its representatives, can take no responsibility for them nor take part in any discussion resulting from sales or purchases; remember "Caveat emptor". In case of dispute, the Editor's decision is final.

Trade or business adverts, even from members, will not be accepted here, since this is a subsidised service to members.

(2) Classified Advertisements are available to members, non-members and commercial firms offering products or services for sale, etc. All adverts not meeting the Hamad criteria will be considered to be Classified Advertisements.

Classified Advertisements will be charged at 40c per word. Bold type is available at 50c per word. For semi-display (ie rule above and below) add $5.00. All Classified Advertisements must be pre-paid, receipts will not be given. All prices include GST.

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(4) Closing date. Please send Hamads and Classified Advertisements to The Advertising Manager, PO Box 1733, Christchurch, to be received no later than the 10th of the month prior to publication. Please make cheques payable to NZART; no cash or credit cards. The Editor and NZART Inc reserve the right to discontinue or decline any advertisement.

For further information and commercial advertising rates, please contact:
Lorne Douglas ZL2AHB, Advertising Manager, c/- PO Box 1733, Christchurch. Telephone (03) 358-9100. E-mail: <hamads@nzart.org.nz>.

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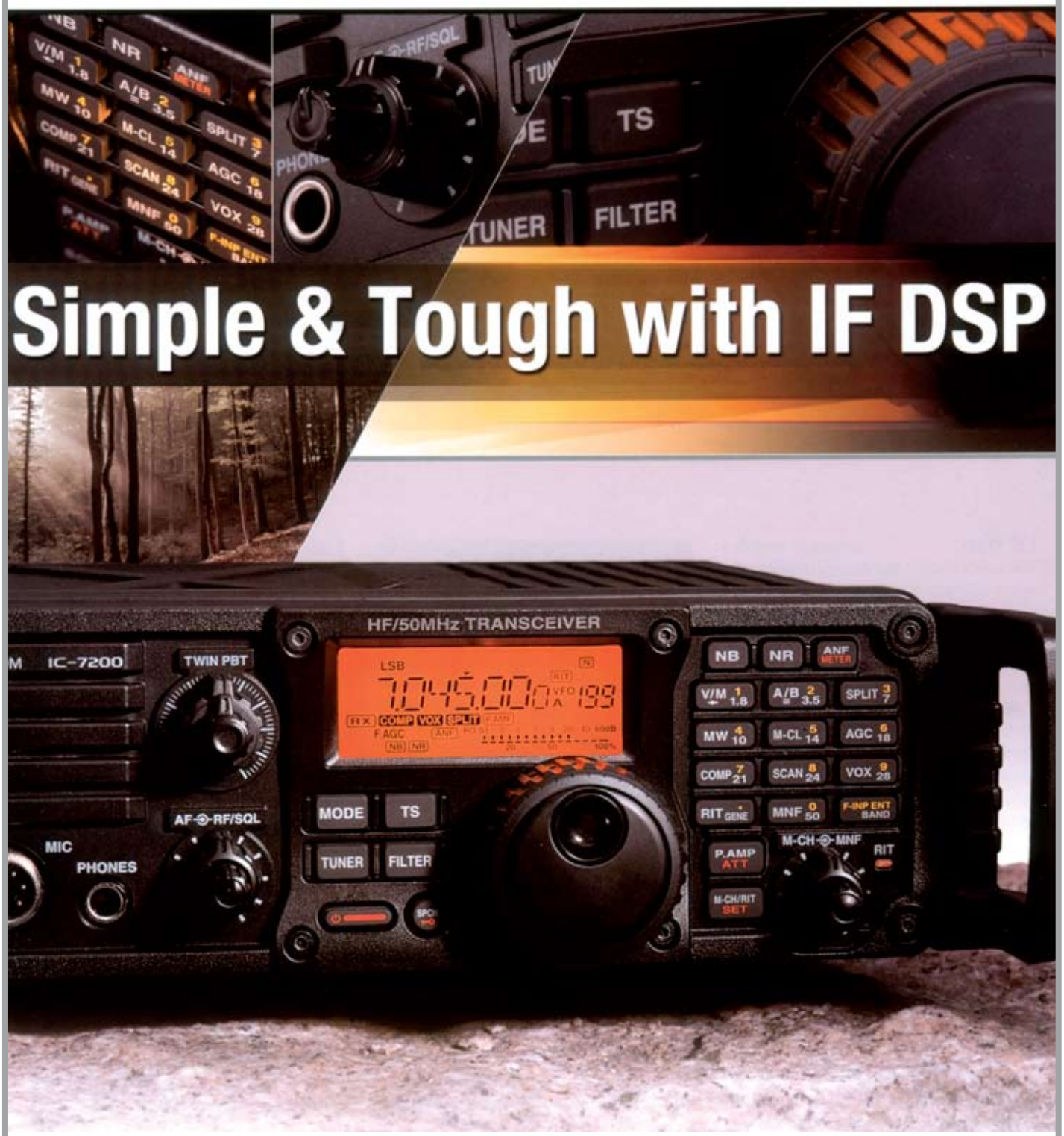

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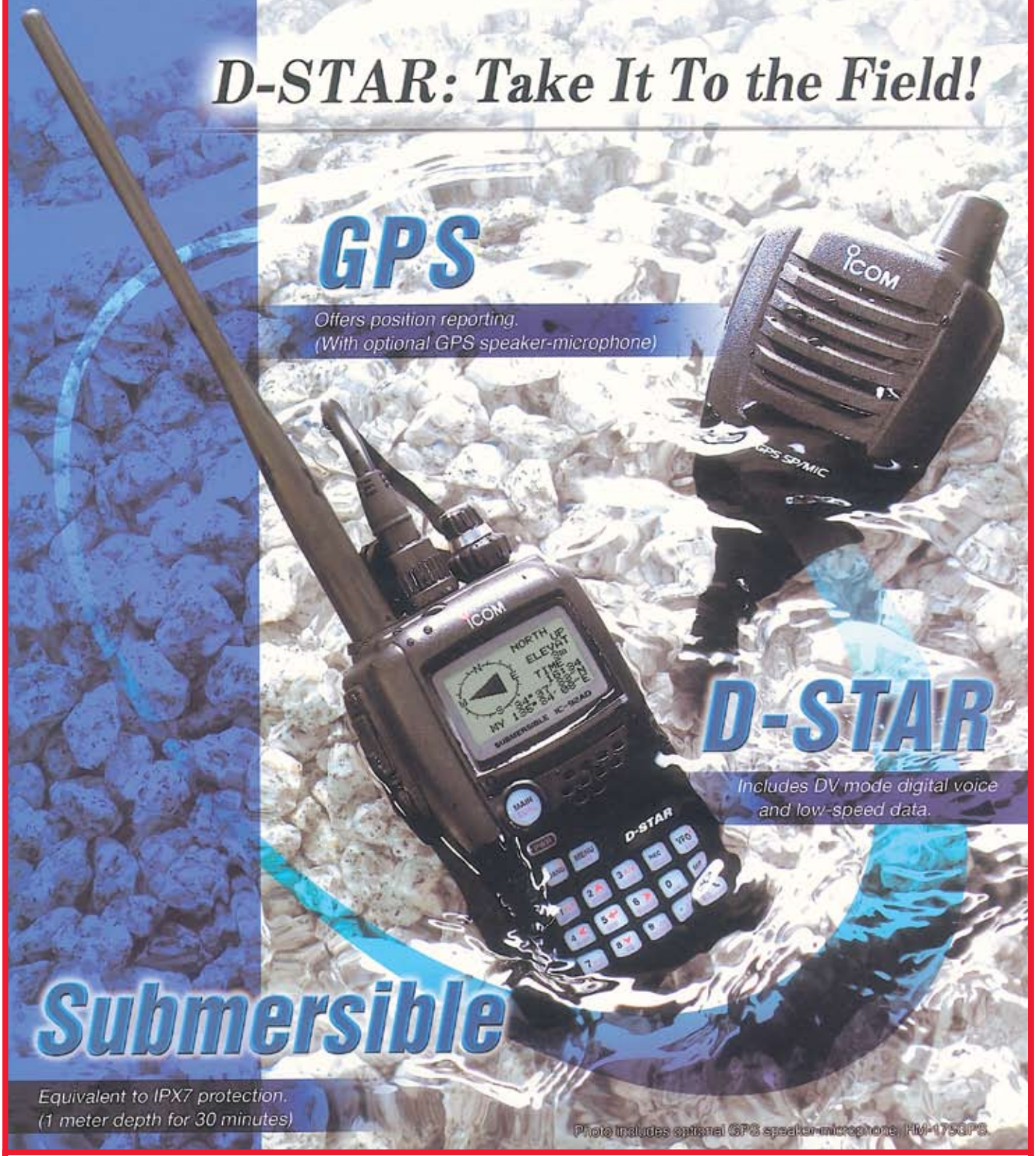

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